The Rise of the Small: Meaning, Metaphysics, and the Microscope

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Dedication

To Jenni and Lily

For every atom belonging to me as good belongs to you.

Abstract

From public reminders to sanitize drinking water to philosophical speculation on the sublime, this study documents how microscopical science appears in a wide range of cultural and intellectual concerns. Interweaving a genealogy of microscopy with readings of literary texts, I show how the microscope embodies certain epistemological formulations that, when discerned and mapped, disclose original literary and philosophical networks. Through readings of Ralph Waldo Emerson, Charles Sanders Peirce, Herman Melville, and Emily Dickinson, along with diverse intertexts from philosophy, science, and literature, I expose the influence that microscopy had on nineteenth century American metaphysics, spirituality, fiction, and figuration. It explores, for example, questions of invisibility and faith in early American writers such as John Winthrop, Jr. and Cotton Mather, who believed that the microscope presented a divinely mandated opportunity to fully comprehend God's universe, and follows through with Emerson's later arguments that the instrument endorses a dangerous mechanistic ideology at odds with his spiritual sensibilities. It explains how Peirce viewed the microscope as a means through which to rescue philosophy from crude and untenable metaphysics, how Melville embraced the microscopical to enact a theory of symbolism, how Dickinson meditated on the spiritual dangers of "looking too closely," and how writers from numerous disciplines have all struggled to make sense of extended human vision. The study closes by discussing the model of "deep time" literary history, and questioning the status of the aesthetic detail when placed on the vast scale of a universe expanded by optical instruments. This cosmic vastness threatens to annihilate the significance of human intellectual pursuits, leading to a "scaling-up" that I argue is best addressed in existentialist terms. The microscope made available a novel means of imagining the infinite while revealing the limits of natural perception, expanding assumed scales of understanding, and challenging inherently prejudiced biological categories and social stratifications. This work demonstrates how the microscope came to be, the polemics it provoked, the ideas it preserves, and the role it played in the formations of nineteenth century philosophy, science, fiction, and poetry.

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Preface.

Friedrich Nietzsche suffered from intense nearsightedness. Twenty minutes of reading or writing triggered acute and unbearable eye pain, throbbing migraine headaches, nausea, and exhaustion. Naturally, he sought relief for his debilitating symptoms, undertaking week long medicinal treatments at facilities like the Bad Ragaz spas in Switzerland and the mineral springs of Recoaro Terma in northern Italy.[1] Because writing for any extended length of time proved too taxing, Nietzsche purchased a typewriter, hoping that the speed afforded by the device would combat the onset of pain. Sometime in 1881 he attained a Hansen "Writing Ball," an early Danish typewriter that resembled a kind of over-sized mechanical pin cushion.[2] In February of 1882, in reference to the Writing Ball, Nietzsche wrote to his friend and confidant Peter Gast, "our writing tools are also working on our thoughts" (qtd in Kittler 204). Friedrich Kittler aligns this statement with a stylistic shift he observes between Nietzsche's early and late works, a shift from "arguments to aphorisms, from thoughts to puns, from rhetoric to telegram style" (203), that is, from a style of writing that demands more than twenty minutes, to a style exhibiting the speed made available by Hansen's typewriter.

Nietzsche's statement, and Kittler's assessment of it, speaks to the profound influence that technology has on modes of being and expression. There exists an entanglement of instruments and the very thought of their users; they are co-operative, and as we use the tools that extend our mental capacities, we "inevitably begin to take on the qualities of those technologies" (Carr 60), consequently making it more difficult to separate social change from technological change.[3] It is not merely that novel

[1] See David Farrell Krell, *The Good European: Nietzsche's Work Sites in Word and Image*. Since his resignation from the University of Basel in 1879, Nietzsche travelled extensively seeking a climate that might better accommodate his condition. While passing through Meiringen (in Bern, Switzerland), for example, he visited the physician Dr. Otto Eiser who recommended he go to Frankfurt for a complete physical. From October 3 to 7, 1877, Nietzsche was examined by Dr. Eiser and his colleagues who "noted the deterioration in [his] retinas" and speculated that "the patient's 'excessive intellectual activity' was the cause" (Krell 104, 126-7, 233).

[2] See Kittler 201.

[3] See Christopher Lasch, "Lewis Mumford and the Myth of the Machine," and Christopher May, "Lewis Mumford," *Key Thinkers for the Information Society*. I do not advocate a strong technological determinist

technologies introduce novel phenomena to a seemingly immutable and homogenous manner of experience, but experience itself is malleable as it is influenced by such technologies. As Lewis Mumford argues, "Probably the most decisive change modern technics has brought about … is the change it has effected in both our concepts and our experience of space, time, energy" ("Technics and the Future of Western Civilization" 39). Just as Nietzsche recognized the typewriter working on his thoughts, Mumford sees the clock as the "key-machine of the modern industrial age," altering one's experience of nature by "dissociat[ing] time from human events" and creating "the belief in an independent world of mathematically measurable sequences" (*Technics and Civilization* 14-5). Mechanical time, or the division of the day into hours, hours into minutes, and minutes into seconds, eventually replaced the organic time determined not by the calendar, but by the events that occupied one's daily life. It wasn't until the advent of the clock that this abstract framework became the primary point of reference for both action and thought, establishing concepts of regularity, efficiency, and measurement: "Abstract time," Mumford continues, "became the new medium of existence" (*Technics and Civilization* 17).[4]

The operative premise of the arguments outlined above is that material artifacts, *things*, prompt and shape ideational change, and that the instruments through which we experience the world play an active role in producing, developing, and communicating

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position, but instead see the entanglement between technology and users as co-operative; chapter two below will explore an argument for the fundamentally historical character that underlies scientific and technological advancements.

[4] Mumford discusses in greater detail the profound influence that the clock has on human thinking:

> When one thinks of the day as an abstract span of time, one does not go to bed with the chickens on a winter's night: one invents wicks, chimneys, lamps, gaslights, electric lamps, so as to use all the hours belonging to the day. When one thinks of time, not as a sequence of experiences, but as a collection of hours, minutes, and seconds, the habits of adding time and saving time come into existence. Time took on the character of an enclosed space: it could be divided, it could be filled up, it could even be expanded by the invention of labor-saving instruments … Abstract time became the new medium of existence. Organic functions themselves were regulated by it: one ate, not upon feeling hungry, but when prompted by the clock: one slept, not when one was tired, but when the clock sanctioned it. A generalized time-consciousness accompanied the wider use of clocks: dissociating time from organic sequences, it became easier for the men of the Renascence [*sic*] to indulge the fantasy of reviving the classic past or of reliving the splendors of antique Roman civilization: the cult of history, appearing first in daily ritual, finally abstracted itself as a special discipline. (*Technics and Civilization* 17)

ideas.[5] It is a premise that scholars of cultural studies, science studies, history, and literary theory have adopted to shape a discipline that brings objects like clothes, houses, cellos, knots, keyboards, typewriters, radios, art works, Rorschach blots, soap bubbles, mounds—the list goes on—into focus in order to examine the potential subjectivity of things and their active influence on culture.[6] The emergence of this massive index of essays, lectures, and narratives concerning particular things suggests to Bill Brown, whose *A Sense of Things* might be considered a seminal text of Thing Theory, an attempt to "fashion an object-based historiography and anthropology" that addresses not only the "idea *of* things," but also the "ideas *in* them" (2-5), and offers a way of "thinking about things as embodied thoughts" (89). This is a premise animating classics of cultural criticism such as Walter Benjamin's "The Work of Art in the Age of Mechanical Reproduction," or Jacques Derrida's "Freud and the Scene of Writing." When discussing surgical operation, for instance, Benjamin locates an interpretive tension between the medical practitioner and the magician. Both the magician and the surgeon operate on the patient: the magician by placing his hands on the body; the surgeon by cutting into it. The telling description Benjamin includes is that the magician "is still hidden in the medical practitioner" (233). Another way of saying this is that the surgeon and her medical tools preserve the aura of the magician, and that the *idea* of the magician remains, perhaps unconsciously, or only partially avowed, *in* the surgeon.

Discerning the ideas *in* things thus necessitates both locating the effects that an object has on thinking, as well as the impulses that the object preserves—that is, the ideas that are embodied by the object. Attending to things in this way amounts to, Brown argues, "granting them an interiority and, thus, something like the structure of subjectivity" (7-8). Andrew Pickering has the same idea in mind when defending his

[5] Since the advent of the Information Age, countless studies have been conducted to test whether or not modern technology is changing brain functioning. The general consensus affirms the hypothesis that technology actually does influence our brains.

[6] In *Things That Talk: Object Lessons from Art and Science*, Lorraine Daston brings together a number of scholarly essays on topics like Bosch's equipment, soap bubbles in classical physics, and glass flowers, as does Sherry Turkle in *Evocative Objects: Things We Think With*. Friedrich Kittler's work mentioned above also includes studies of the gramophone and film. In science studies, authors such as Andrew Pickering, Karin Knorr-Cetina, Paul Feyerabend, Bruno Latour, and Steven Shapin explore the notion outlined above that scientific practices actually construe the objects that tradition holds are there to be discovered in nature.

"ontological vision of the world … in which both the human and the nonhuman are recognized as open-endedly becoming" (1). For Pickering, people and things "take on emergent forms" together, shaping one another in relation to one another, in real time, in an adaptive "dance of agency" (1). Brown offers a similarly "indeterminate ontology," where "things seem slightly human and humans seem slightly thing-like," an ontology where "ideas and things … somehow merge" (13, 3).

The notions that things shape human thought in peculiar ways and that objects possess a certain "sentience" (and not simply a politics) built into their very specifications have certainly gained momentum in recent literary and cultural theory. But the core insight is by no means novel. It is a thought with a genealogy in many earlier literary and artistic works, as seen in Brown's reading of Mark Twain, Frank Norris, and Henry James, or Pickering's contrast of Piet Mondrian with Willem de Kooning. Edgar Allan Poe had voiced it in his "The Fall of the House of Usher," when his unnamed narrator wonders at Usher's "lofty reasoning" regarding the "sentience of all vegetable things," an idea he mentions "not so much on account of its novelty, (for other men have thought thus,) as on account of the pertinacity with which [Usher] maintained it" (22). The narrator highlights the uneasiness of the opinion, and of his host's mental condition, saying,

> [I]n his disordered fancy, the idea had assumed a more daring character, and trespassed, under certain conditions, upon the kingdom of organization ... The belief … was connected … with the gray stones of the home of his forefathers. The conditions of the sentience had been here, he imagined, fulfilled in the method of collocation of these stones—in the order of their arrangement, as well as in that of the many fungi which overspread them, and of the decayed trees which stood around—above all, in the long undisturbed endurance of this arrangement, and in its reduplication in the still waters of the tarn. Its evidence—the evidence of the sentience—was to be seen, he said … in the gradual yet certain condensation of an atmosphere of their own about the waters and the walls. (22)

Readers of "The Fall of the House of Usher" will usually notice how the house itself becomes a kind of character, how it restricts the movements of its inhabitants and determines what can and cannot be seen. Upon his entrance, for example, the narrator describes inaccessible windows through which "[f]eeble gleams of encrimsoned light made their way … and served to render sufficiently distinct the more prominent objects around." "[T]he eye," he continues, "struggled in vain to reach the remoter angles of the chamber, or the recesses of the vaulted and fretted ceiling" (17). This is not the first allusion to Usher's "daring" idea that the organization of things "fulfills the conditions" of their sentience; in fact, Poe frequently references the agency of the house, as doors close on their own (19), "terrestrial objects" glow (25), and guitars "speak" (19). In Poe's gothic world, what might be merely rhetorical flourishes of personification and the like threaten to turn ontological in consequence. A hesitation concerning boundaries of animate and inanimate is precisely the issue. His narrator speculates that "a mere different arrangement of the particulars" could "modify" or perhaps "annihilate its capacity for sorrowful impression," as Usher traces his malady to the "form and substance of his family mansion," whose "influence" brought about "the *morale* of his existence" (18-9—Poe's emphasis).

The sentience of things is even more pronounced in Theodore Dreiser's *Sister Carrie*, as its pages are filled with images of objects working upon the story's characters and movements. Take for example what is arguably the plot's climax, where George Hurstwood deliberates stealing some ten thousand dollars from the safe mistakenly left opened by the cashier at Fitzgerald and Moy's, the saloon he manages. The money presents to Hurstwood a simple solution to his problems; it would finance his wish to run away with Carrie, as he knows that he will likely lose everything to his wife when he does. He wrestles with the thought of taking the money; he opens and closes the safe several times, never moving the knob, which might activate the latch and "so easily lock it all beyond temptation" (183). As he struggles, a strange voice appears, asking, "Did you ever have ten thousand dollars in ready money?" (183). "The safe is open," encourages the voice, "There is just the least little crack in it. The lock has not been sprung" (183). It could be the safe speaking to him, or perhaps the clock on the wall, whose "solemn voice … ticks with awful distinctness, 'thou shalt,' 'thou shalt not,' 'thou shalt,' 'thou shalt not'" (184). In any case, the safe has the final say in the dilemma, for as Hurstwood stands with the money in hand, resolved to leave it be, the lock clicks on its own, sealing itself along with Hurstwood's fate. "Did he do it?" the narrator asks, implying the indeterminacy of the culpable agent, hinting that he did not.

And yet, while the premise concerning the sentience of things is not a recent concept, it does seem to gain currency with modernity, likely generated by the mass-production of objects that intensified by the turn of the century. A survey only of works of literary realism displays the trend, in that both objects mass-produced and the effects of mass-production—commodity desire, the miser, the "rags-to-riches" myth, gambling, etc.—lace the pages of *Sister Carrie,* as well as Frank Norris's *McTeague*, William Dean Howells's *The Rise of Silas Lapham*, Elizabeth Stuart Phelps's *The Silent Partner,* and Edith Wharton's *House of Mirth*. "There is no doubt," argues Vaclav Smil, "that the two generations between the late 1860s and the beginning of WWI remain the greatest technical watershed in human history" (13). The late nineteenth century was a world of trains, telegraphs, electricity, photography, sound recording, and countless other innovations, where objects like the ballpoint pen and theories like thermodynamics fundamentally altered daily life. Brown notes that Ralph Waldo Emerson may have earlier foresaw, and feared, the "extent and multitude of objects" multiplying around him (24), the "exponentially increasing … number and kind[s] of goods for sale" made available by an unprecedented pace of production coupled with "new forms of mass distribution," such as "mail-order houses, chain stores, [and] department stores" (5). Emerson's fear has its analogue in the dramatic conclusion of "The Fall of the House of Usher," perhaps even as the motivation for what can be read as Poe's representation of a break with the Gothic mode: the modern "hero" escapes the crumbling Gothic mansion, and thereby flees the past, as well as the scene. The narrator not only flees a world now antiquated, but also "the unsatisfactory conclusion, that while, beyond doubt, there *are* combinations of very simple natural objects which have the power of thus affecting us, still the analysis of this power lies among considerations beyond our depth" (14-5—Poe's emphasis). The narrator realizes that although we lack the vocabulary to access this obscure "power thus affecting us," we can no longer live in a world that denies the sentience of things.

Taking this premise as a starting point—that things have ideas in them, that they embody and preserve epistemological formulations, and that one may map a thing's epistemology by bridging disciplines, periods, and places—my dissertation explores in depth, and among other objects, a signature scientific and conceptual tool: the microscope. I ask: what ideas can be created and preserved in a microscope; more provocatively, how does a microscope "think"? and what does it mean to "think microscopically" during a period of radical change in instrumental mediation?

The eye stands as the model with which the microscope is traditionally compared, and thus the instrument is often represented as an extension of natural sight.[7] The microscope is thought to enhance nature, breaking the limits of perception and perfecting the senses. And so use of the microscope is often described as a manually functioning optical system that simply duplicates the natural optics of the eye: the user prepares and fastens a slide on the stage as the eye concentrates on an object; she aligns her eye with the microscope's eyepiece, turns a series of knobs (course adjustment, fine adjustment, substage adjustment), and gently tilts the mirror (or switches on its electrical light source), to bring the object into focus, just as the eye contracts and bends to control the entering light and focus an image on the retina. The microscope performs a much slower, but nonetheless equivalent, function of focus as does the eye, and early microscopists emphasized the similarity when defending the instrument against the challenge that peering through a lens amounts to a fundamental distortion of vision. "From the perspective of eighteenth-century geometrical optics," writes Jutta Schickore, "the eye—the natural optical tool—and the microscope—the artificial optical tool—were alike" (23). Schickore continues,

> The human eye and the microscope belonged to the same kind of optical apparatus—one, the product of divine creation, the other, man made … The demonstration of this resemblance could also serve as an argument to make the microscope legitimate. Microscopes could assist the eye because they helped the eye perform its task more efficiently than it did by nature, and this assistance was possible because both the natural and the artificial optical tool performed the task

[7] See Jutta Schickore, *The Microscope and the Eye: A History of Reflections, 1740-1870*.

> in the same way. Because of the similarity of their function, the microscope and the eye could be regarded as equally reliable discoverers of truth, and in combination they improved the observer's sight. (23)

The microscope had disclosed a different world—it had, Charles Sanders Peirce noted, "transported our race to another planet" (5.513). But it is also, of course, the same world merely viewed differently. In this sense, the microscope produces a mode of vision that is both different from natural sight and a copy of it. To legitimize the microscope it was necessary to make its novel discoveries acceptable as truths of reference rather than simple products of optical illusion generated by the apparatus as in centuries of light- and lens-based showmanship. The argument that the microscope equals the eye, just enhanced with power, entailed a different kind of defiance: to argue that the instrument can "improve," even "perfect" the observer's sight is to imply that man is, by nature, imperfect, and that our god given senses do not directly correspond with a divinely created world; that there are things—not just spiritual, but physical things—to which we are denied natural access.

What one does when one uses a microscope is more than the mere manual focusing of lens and light systems. To use a microscope is to isolate an object, to take it out of circulation and to place it on a slide. One tears a thing from out of its context, dissects that thing, and de- and re-categorizes it. As the microscope magnifies an object, it simultaneously demagnifies everything around it, blurs its boundaries, fosters a myopic manner of viewing; and as it isolates an object from the whole, it conversely emphasizes the object's particularity. Issues of framing and mediation take on a pressing relevance. I attempt to demonstrate that several fundamental ideas—of particularity, isolation, and dissection, among others—are embodied in fresh ways by the microscope as they present reversals of traditionally held philosophical positions. The microscope, by preserving and emphasizing these ideas, triggered a shift towards privileging particularity over totality, metonymy over symbolism, and induction over deduction; the microscope, in short, helped formulate a world where metaphysics and *a priori* categories were no longer tenable.

Theorists like Bill Brown and Andrew Pickering routinely focus on particular objects to map out each object's interiority; focusing on objects is precisely what the microscope does. Besides its role as an important instrument "working on our thoughts," I would like to suggest that the microscope is especially interesting because it is an object that made available the thinking of objects as peculiarly sentient, as containing multifaceted properties previously inaccessible and invisible. The microscope, I argue, gave rise to the thinking of objects in these novel ways. Firstly, by emphasizing the minute thing detached from physical and metaphysical contexts, it encouraged an ontology of particularity where, to repeat Brown's claim, "things seem slightly human and humans seem slightly thing-like" (13). Secondly, by disclosing things as places—as distinct habitats for microorganisms, for instance—no longer could common objects be defined as purely homogenous, smooth, and self-evident.

This is to say that, by exposing a complex *terra subvisibilia*, a subvisible world thriving just beneath the threshold of perception, the microscope also introduced a novel means of questioning the correspondence between reality and figuration, between interpretation and perception, and between words and things. It magnified not only objects, but also the flaws of *a priori* metaphysical categories that fail to account for this microworld. The enthusiasm for the microscope that emerged first during the latter half of the seventeenth century, its so-called "golden age," and then again during a mid-nineteenth century revival, challenged scientists, philosophers, and artists to reevaluate theories of perception, cognition, interpretation, and classification. My analysis aims to disclose both the ideas preserved in the microscope and how these microscopical ideas figured modern revisions to classical metaphysics and theories of meaning. This is what my project attempts to do: to think the thoughts that the microscope embodies and to demonstrate how the microscope "is working on our thoughts."

As Schickore notes, the early nineteenth century marks a period that "has often been described as crucial for the microscope's establishment as a research tool" (1). The resurgent interest in microscopy that appeared during the nineteenth century may be traced to the production of the achromatic lens in the 1820s, what James Cassedy calls a "breakthrough" that was "directly responsible for large parts of the proliferating scientific knowledge of the remainder of the nineteenth century" (76).[8] And so a new microscopy unfolded conterminously with Emerson's, Melville's, Peirce's, and Dickinson's careers: Emerson reached celebrity with "Nature" in 1836; the first microscopical society was founded in 1839; Dickinson attends Amherst Academy, known for its offerings in science, from 1840-7; Melville published *Moby-Dick* in 1851; non-specialized books and user guides on microscopy became increasingly popular throughout the 1850s; the U.S. Department of Agriculture instituted its Division of Microscopy in 1871; Peirce laid the groundwork for pragmatism with "Illustrations of the Logic of Science" in 1877-8.[9] Accepting the premise that technologies and the modes of perception generated by scientific instruments form, or "work on," thinking itself, shaping the way we engage with and interpret the world, my analysis will reveal how the microscope significantly influenced the scientific, philosophical, and literary thinking figured by these authors.

A word about method. My study examines how Emerson, Peirce, Melville, and Dickinson each considered the epistemological formulations associated with the microscope and the world of *subvisibilia*. My method consists of locating and interpreting terms and names associated with microscopy—animalcules, atoms, magnifiers, microcosms, lenses, Leeuwenhoek, Hooke, Amici, etc.—throughout the published works and journals of these authors. I analyze how each author uses these terms—metaphorically, illustratively, objectively, deridingly, supportively, etc.—asking to what effect microscopical knowledge had on the position put forth. From the passages charged with microscopical knowledge, I work out a set of ideas operating on the posing and solving of certain related problems. The most pronounced problems—the dialectic of particular and whole, the uses and misuses of dissection, the role of observation, the

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[8] Former Secretary of Agriculture J. Sterling Morton had abolished the Division of Microscopy in 1895 claiming that it had become obsolete due to the instrument's widespread use in nearly every bureau of the Department (Gage 72). The developments of achromatic optics will be addressed in the chapters below.

[9] By pointing out that this technologically-driven science unfolded conterminously with these authors, I run the risk of assuming a strong technological determinist position. However, by demonstrating that the microscope is itself an ideologically constructed, and ultimately contested, thing, I hope to show that the instrument is a product of discursive conflicts. Though the microscope may have altered the way people thought about the world, I argue that the "scientific knowledge" it produced is always already linked to a number of metaphysical, spiritual, and political discourses.

disruption of metaphysics, the privileging of competing figurative tropes, the status of the detail, the scales that frame thinking, etc.—lead me to formulate and analyze the ideas that each author associates with the microscope and its importance as a significant means of engaging with these problems. After locating appearances of microscopical knowledge in the literary, philosophical, and scientific works of these authors and discerning the ideas they associate with the microscope, I return back to the texts to read in a way that highlights the transformative nature of those ideas.

“The great landmarks in the history of science,” Peirce writes, “are to be placed at the points where new instruments, or other means of observation, are introduced” (1.102). Taking Peirce at his word, this study determines the points of contact amongst the microscope’s evolution and its appearances in the works of these authors, thereby disclosing how the instrument serves as a “great landmark” contributing to philosophy, science, and literature. As such, the project interweaves a detailed account of the microscope’s construction, evolution, and movement, the polemics associated with the microworld and its rise to popularity, with the ideas it preserves as represented in the works of these thinkers. My study develops a narrative of responses from the philosopher, to the scientist, to the artist, to reveal not only its significance for these authors, but also what one endorses, consciously (and less than consciously in some cases) when one peers through the microscopical lens. That is, I hope to have illustrated both how the instrument figures the thinking of these authors, and how these authors figure our understanding of the microscope.

Introduction.

"The eye struggled in vain": On a Genealogy of Microscopy

This introductory chapter will attempt to construct a narrative of the microscope's creation and proliferation as it identifies some of the challenges it presented to established systems of knowledge. Reviewing some of the polemics associated with the early rise of microscopy allows, I think, for a better understanding of the ideas conveyed by the science, ideas associated with specific and potent controversies that formulate the instrument's embodied epistemology. But because my interests lie in the revival of the microscope, and how the ideas *in* the microscope are figured by these four nineteenth century authors as they offer a way to map certain literary connections, I admit that this analysis of the microscope's seventeenth century "golden age" polemics is not comprehensive; it will merely scratch the surface of the exchanges and disagreements amongst early modern scientists, philosophers, and theologians in their response to subvisible discoveries.[10] The introduction will offer an account of the microscope's transatlantic movement, detailing the possible avenues of its American assumption, to better set the parameters/scale of my study concerning the microscope's nineteenth century advancements and rise to popularity taken up in the subsequent chapters. As such, it intends to put forth what looking through the microscope could mean, as a mode of viewing tied to concepts of particularity, isolation, dissection, and disruption.

Magnification

Histories of optical instruments are often less concerned with the epistemological currents informing or informed by them; instead, many tend to focus on early descriptions of lens combinations to address who ought to be credited with the invention of the microscope, or the telescope, or eyeglasses, etc. Reginald Clay and Thomas Court,

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[10] I take the qualifier "golden age" from Lorande Loss Woodruff's "The Advent of the Microscope at Yale College."

for example, detail the first successful telescopic lens arrangement as belonging to either Leonard Digges or William Bourne, and Henry King, in his *The History of the Telescope*, investigates early seventeenth century patent petitions to make the case for Hans Lippershey over James Metius.[11] Cases have been made for Zacharias Jansen, Joris Hoefnagel, Francesco Fontana, Galileo, and a host of others, as the "true inventor" of the

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[11] See especially Reginald S. Clay and Thomas Court, *The History of the Microscope, Compiled from Original Instruments and Documents, up to the Introduction of the Achromatic Microscope* 73. This work, written primarily by Thomas Court, has become a landmark account for historians of microscopy; one is unlikely to read any scholarly work on the subject written after 1932 that doesn't reference Court's *History*. His contributions to the field, other than this key text, include his massive collection of scientific instruments—trumped only by the famous Frank Crisp collection—his other scholarship on the role of optical instruments in connection with scientific discoveries, his global reach to microscopists who eagerly sought his advice, and his service as counselor to collectors and institutions. Clay and Court's evidence for Leonard Digges's place in the early history of the telescope comes from the preface of the 1571 work *Pantometria*, a book of geometry written in concert with his son, the mathematician and astronomer Thomas Digges. Thomas Digges is esteemed in the history of science for being the first to expound the Copernican system in English. His observations of a 'new star,' or Tycho Brahe's Supernova, published in his 1573 *Alae seu scalae mathematicae*, provided empirical evidence for the consideration of alternative theories of the universe, consequently upsetting the Catholic Church, who began to view such alternative cosmological theories as heretical. In the *Pantometria*, Digges describes compound lens systems along with concave and convex mirrors—"proportionall Glasses duely situate at convenient angles" (qtd. in Wilson 73)—that enabled his father to see as far as seven miles off. William Bourne had described a similar use of lenses as did Thomas Digges, even mentioning Digges by name and confirming his claims about the usefulness of lenses and the ability to see objects from a great distance.

King claims that Bourne's eyes were undoubtedly hypermetropic, based on his reports of distant objects, but what is interesting about Bourne's descriptions is that it indicates that he may have actually looked through a compound instrument to obtain the appearance himself (29). Giambattista Della Porta of Naples published his *Magia Naturalis* at about the same time as Bourne wrote his treatise, and included in it similar descriptions of concave glasses used to observe distant objects, but scholars tend to disregard his work. King calls him "an unreliable and imaginative writer" who "on this occasion, was probably out to impress his readers" (30), and Wilson suspects accounts like Porta's of referring to eyeglasses "rather than to visual aids like telescopes and microscopes" (74). "Porta's description of a lens combination," Wilson writes, "most likely refers to bifocal spectacles rather than to a telescope-microscope" (74).

It is in Holland where the documented invention of the telescope, outside of mere descriptions of lenses producing telescopic views, first appears and its invention is attributed to either Hans Lippershey of Middleburg in Zeeland or Jacob Adriaanzoon (aka James Metius), a native of Alkmaar. Both definitely made telescopes, and both petitioned the States-General for a patent in 1608. Both also say that the invention occurred accidentally: Lippershey had apparently witnessed two children playing with some lenses in his shop and noticed that the weathervane of a nearby church appeared larger when two lenses were held at a certain distance; Metius said that he had "probed the secrets of glassmaking," when he accidentally came across the magnifying phenomena (King 30-1). Lippershey's petition beat out Metius's by a few weeks, but the controversy it stirred led to the governing committee's decision to decline a patent to either claimant (King 30-2). Wilson appears to defend Lippershey as the inventor of the telescope, and asserts that the instrument that resulted from his petition for an exclusive right of manufacture "quickly transmitted westward into England and southward into France, Germany, and Italy" where it "achieved instant celebrity through the series of sensational observations of the moon and planets made by Galileo in 1609-10 and reported in his *Sidereus nuncius*" (74). A third contender for the honor of the telescope's invention is Zacharias Jansen, but, as King asserts, "it is far more probable … that [he] made, not the first telescope, but the first compound microscope" (32) sometime around 1590.

microscope. Though Jansen usually receives the honor, Huib J. Zuidervaart, Albert Van Helden, and others have worked to discredit him, citing the inconsistency of the dates he used to "prove" his claim, as well as his suspicious and felonious history—he was charged with coining false Spanish money, suggesting to Zuidervaart that "his optical workshop … could have functioned as a cover for these highly illegal activities" (44).[12] Such histories, according to Catherine Wilson, reflect the notion that the earliest scientific instruments were "made, exchanged, and kept as models or symbols of possession of

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[12] See especially: Huib J. Zuidervaart, "The 'True Inventor' of the Telescope: A Survey of 400 Years of Debate" 9-44, and Albert Van Helden, "The Birth of the Modern Scientific Instrument, 1550-1700" 49-84.

Most historians of microscopy, including Clay and Court, locate the earliest mention of the microscope's creation in a letter dated 1610, written by William Boreel, the Dutch envoy at the court of France. In this letter, which was collected and archived by the king's physician Pierre Borel, the envoy states that,

> Hans, in 1591, when I was born, inhabited a neighbouring house, and I knew his son Zacharias, as I have often heard, invented first the microscope, and gave one to Maurice the Governor, and the Head of the Belgian Army. Later a similar one was sent to Albert, Archduke of Austria, supreme ruler of the Belgian kingdom. When I was an envoy in England in 1619, Cornelius Drebel [*sic*] of Holland … showed me the very instrument … nor was it (as they are shown now) with a short tube, but the tube was almost a foot and a half long, made of gilt brass two inches in diameter supported by three dolphins of brass. The base was an ebony disc, on which were placed the minute objects which we looked at from above enlarged almost miraculously. (Clay and Court 8-9)

The Zacharias mentioned in the letter refers to Zacharias Jansen, a Dutch spectacle-maker who, had reportedly aided his father in engineering the modern microscope in 1595. Boreel knew both Zacharias and Cornelius Drebbel, making his testimony between these two seemingly reliable. However, Zuidervaart argues that the letter is laced with inconsistencies and contradictions, which he displays in his "The 'True Inventor' of the Telescope: A Survey of 400 Years of Debate" (43, n. 109-110). A series of copper-plate engravings published by George (or Joris) Huefnagel (or Hoefnagel) in Frankfort in 1592 are thought to have been drawn with the aid of a microscope, thus indicating its use prior to Jansen's claim of its invention. But it is likely that these engravings were made with the use of a short focal length lens (See Wilson 75 and Clay and Court 8-9).

Francesco Fontana, a lawyer and astronomer, claims himself as an original inventor of the microscope in his *Novae Coelestium Terrestrium Rerum Observationes* (1646), saying he made one in 1618. Clay and Court believe Fontana's bid may be dismissed, however, arguing: "As one of Drebbel's microscopes had reached Rome in 1624, Fontana's claim to be the inventor can almost certainly be set aside" (9). There are arguments to be made for Galileo as the original inventor of the microscope as well, based on correspondence between Agnolo Marzi Medici and a "Grand Duke from 'countries beyond the Mountains,'' that Professor Gilberto Govi thinks may be dated 1624 (See Gilberto Govi, "The Compound Microscope invented by Galileo"). The argument for Galileo's claim over-against the claim for Jansen cites both the late publication of the letters evincing Jansen's invention (taking away from it the weight that contemporary records would carry) and the fraudulence of Boreel's testimony, which has been proven specious in other matters; still, the general scholarly consensus ascribes the invention of the microscope to Jansen. The Boreel letter above indicates that Drebbel had a microscope in England in 1619, and by 1671, several of his microscopes had made it to London, where Huygens reports to have seen them (See Clay and Court 9). Clay and Court speculate that these instruments may have been examples of the single microscopes known as the "microscope pulicare" or the "flea microscope."

certain kinds of knowledge" (70) more so than they were actively used.[13] Even in the seventeenth and eighteenth centuries, Wilson continues, "the scientific community … was more interested in designing and possessing optical instruments than in using them to explore the world" (84). And so these biographical accounts of instrument invention appear to follow suit, as they tend to pass over the ideological disputes generated by the assumption of certain instruments and focus instead on the introduction of specific design features, artistic adornments, and device manufacture—on the "glass and brass" of the completed microscope.

Though many scholars disagree on the specific dates of production and the particular persons to whom optical advancements ought to be attributed, most outline the narrative of the microscope's invention in the following way: vague references to "feats of miniaturization" made by ancient historians and naturalists; the movement of early optical theories originating from the Islamic Golden Age to Europe; the invention of spectacles; the invention of the telescope; and, eventually, the invention of the microscope. Skepticism and contention meet with every step, but this general shape of the microscope's arrival is commonly accepted.

While numerous ancient thinkers certainly noticed that objects submerged in water appeared differently, typically larger, they nevertheless ignored the influence that the glass had on the appearance, leading historians to conclude that the ancients had no real knowledge of lenses. And so, early "feats of miniaturization," such as descriptions of the minute from Strabo and Pliny the Elder, Seneca, Archimedes, and Ptolemy, tiny ivory sculptures crafted by Callicrates and Myrmecides, and Nero's use of an "emerald held close to the eye" (Wilson 72) to better see gladiatorial events from a distance, are considered remarkable achievements, but those made without the assistance of magnifying instruments.[14] The first description of the action of lenses to reach Europe

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[13] See also Cassedy 78.

[14] Wilson includes ancient reports of Strabo having penned a complete version of the *Iliad* onto a single sheet of paper that could fit inside of a nut, and that Pliny the Elder, known for his finely detailed descriptions of insects, had "mentioned Nero's use of an emerald held close to the eye at gladiatorial games, presumably to help him see at a distance, in his *Natural History*" (72). The entry for "Myrmecides" in volume II of William Smith's *Dictionary of Greek and Roman Biography and Mythology*, acknowledges the architects' association with "feats of miniaturization":

probably came from Ibn al-Haytham, who authored his treatise on optics, *Kitāb al-Manāẓir*, sometime between 1011 and 1021. Ibn al-Haytham was not the only polymath living during the Islamic Golden Age to study optics, but his work, with its seemingly comprehensive investigations of light refraction and eye structures stand out as, perhaps, "the most distinguished example" of the "high quality of the Muslim's systematic research in vision and light" (Turner 196).[15] Another famous work of al-Haytham's, called *al-Shukūk ʻalā Baṭlamyūs* (*Dubitationes in Ptolemaeum*), is often referred to as the most elaborate codification and criticism of Ptolemaic astronomy.[16] By the late twelfth and early thirteenth centuries, al-Haytham's theories had been disseminated throughout Europe, taken up most notably by Witelo and Roger Bacon.

> MYRME′CIDES (Μυρμηκίδης), a sculptor and engraver, of Miletus or Athens, is generally mentioned in connection with Callicrates, like whom he was celebrated for the minuteness of his works.
>
> [CALLICRATES.] His works in ivory were so small that they could scarcely be seen without placing them on black hair. (1129)

Additionally, in *The Philosophical Works of the late Right Honorable Henry St. John, Lord Viscount of Bolingbroke* the following description of Myrmecides and Callicrates appears: "Myrmecides … was famous in his time, as well as one Callicrates, for making bees, and flies, and ants, and other small insects in ivory" (183).

Though these scattered references from the ancient world may lead one to believe that optical instruments or magnifiers similar to microscopes and telescopes were available to early Greek naturalists, many historians of microscopy disagree. Clay and Court, for example, argue that "Archimedes, Ptolemy and others, although they knew that there was a refraction at the surface of a glass of water, failed apparently to connect it with the shape of the surface, but attributed the effect solely to the nature of the medium" (2), and because they regarded the magnification of objects under water as a property of the medium rather than the geometric form of the glass, they were unable to improve early lenses to increase their power. Clay and Court cite claims concerning the incurability of myopia, made as late as the thirteenth century, as evidence of the lack of knowledge regarding optical lenses (2). Wilson agrees, noting that "more recent historians have tended to regard these stories with skepticism, arguing that extreme nearsightedness rather than the use of magnifying instruments can account for the fineness of detail achieved by ancient craftspeople" (72). It was not until the late twelve and early thirteenth centuries that Europe witnessed any real advance in optical theory.

[15] Born in Basra, Iraq in 965, Ibn al-Haytham, or Alhazen, was educated in Baghdad during the Islamic Golden Age, and eventually settled in Egypt where he was hired to help engineer a control system for Nile River flooding. As Howard R. Turner describes, "Of all known medieval scientific texts, his comprehensive *Kitāb al-Manāẓir* (Book of Optics) is perhaps the most distinguished example in terms of its experimental and mathematical arguments, as well as in its presentation of new and original theory" (196). Turner continues, "Ibn al-Haytham investigated virtually every aspect of light and human sight. He studied the way light is refracted, or bent, by water, air, and mirrors. He came close to a theory of magnifying lenses. He examined the rainbow, aerial perspective, and sunlight. He explained correctly why the sun's and moon's diameter appear to increase as these bodies approach the horizon" (196). Historians of microscopy routinely cite al-Haytham's treatise as a landmark work of optical theory that significantly influenced the advancements of lens manufacture in Europe. See also George Saliba, *Islamic Science and the Making of the European Renaissance*.

[16] See Saliba 24.

Witelo's influential *Perspectiva* has been considered more of an aping of al-Haytham's treatise than an advancement of original optical theory—it seems he merely rewrote al-Haytham as he understood him, which was not always correctly (Clay and Court 4). His contemporary Roger Bacon displays greater competency of lens qualities and manufacture in his *Opus Majus*, where he describes a variety of optical experiments made with mirrors, prisms, and lenses.[17] He had read al-Haytham in translation, whose influence he makes explicit throughout the *Opus Majus*, and especially in Part V, "Optical Science." Bacon scholar Stewart Easton goes so far to say that, "by the time of the *Opus Majus*," al-Haytham's book on optics became for Bacon the "fundamental text-book for his favourite science" (71). Following al-Haytham's lead, Bacon studied, among other things, the refractive properties of transparent mediums and the reflective properties of differently shaped mirrors. He noticed the magnifying potential of curved glass, writing, "If a man looks at letters or other small objects through the medium of a crystal or of glass or of some other transparent body placed above the letters, and it is the smaller part of a sphere whose convexity is toward the eye … he will see the letters much better and they will appear larger to him." He continues, "Therefore this instrument is useful to the aged and to those with weak eyes. For they can see a letter, no matter how small, sufficiently enlarged (574). His prolific work on optics, the many optical experiments with which he was familiar, and his investigation of manufactured magnification, suggests the probability that he would have attempted to combine lenses to increase magnification, a necessary step towards the construction of the microscope.

The passage concluding the "Optical Science" section of the *Opus Majus* is often referenced in histories of optics as, arguably, the earliest description of telescopical and microscopical lens arrangements. Here, Bacon speculates on the "wonders of refracted vision," that allow "very large objects [to] be made to appear very small, and the reverse," as well as "very distant objects [to] seem very close at hand, and conversely," and pushes the observation to predict that,

> we can so shape transparent bodies, and arrange them in such a way with respect to our sight and objects of vision, that the rays will be refracted and bent in any

[17] See Brian Clegg, *The First Scientist: A Life of Roger Bacon* 47-8.

> direction we desire, and under any angle we wish we shall see the object near or at a distance. Thus from an incredible distance we might read the smallest letters and number grains of dust and sand owing to the magnitude of the angle under which we viewed them, and very large bodies close to us we might scarcely see because of the smallness of the angle under which we saw them, for distance in such vision is not a factor except by accident, but the size of the angle is. (582)

The important step Bacon makes here should be clear: he sees in the distortion of perception offered by manufactured glass the possibilities of accessing previously undisclosed phenomena. The microscope will be engineered from out of the proper shaping of transparent bodies into lenses, and the proper positioning of these lenses at specific distances. Such experiments require a greater availability of lenses, which occurs with the increased production of those instruments Bacon described as "useful to the aged," eyeglasses.

The lenses that Bacon references, those used to aid reading, would be either laid directly on the page itself, or else held just above it. According to Clay and Court, the progression from the kinds of lenses described in the *Opus Majus* to wearable spectacles probably came about through experimentation by various monks, monks being "almost the only men who could read and write" (5). Clay and Court give their account of the genesis of eyeglasses, writing,

> Monks … who wished to continue their writing and copying of manuscript as they grew older, would first have made use of such a lens held in the hand; then it would have occurred to someone to support the lens independently, so as to have both hands free, and the best way would have been found in attaching it to the head. To use a pair of lenses, one over each eye, was a fairly obvious step, and thus spectacles may have been invented. (5)

That "someone" to whom the notion occurred is yet undetermined, but the general consensus is that European spectacles were invented in Italy sometime near the end of the thirteenth century.[18] By the sixteenth century, literacy had expanded outside of the

[18] Spectacles were independently invented in China, and were likely invented much earlier there than they were in Europe. As for the European inventor of spectacles, scholars are as yet undecided. An early manuscript dated 1299, titled "Trettato del Governo da Sandra di Pipozzo di Sandro Fiorentino," states: "I find myself so pressed by age that I can neither read nor write without those glasses they call spectacles, newly invented, for the great advantage of old men when their sight grows weak" (qtd. in Clay and Court 5), and Friar Giordano da Rivalto of a monastery at Pisa had referenced spectacles in a sermon given February 23, 1305, saying, "it is not yet twenty years since there was found the art of making spectacles

monastery, and with this rise of mass literacy came an unforeseen problem: myopia. Whereas presbyopia, Wilson argues, "results almost inevitably from the aging process," myopia, nearsightedness, can be "facilitated in its development by a lack of practice in focusing on distant objects" (74). The disorder became especially prevalent amongst juvenile readers, and thus prompted a new demand to understand it. The discovery that nearsightedness could be corrected with lenses led to an "increase in the manufacture of and trade in spectacles in the last quarter of the sixteenth century" (74), which consequently made it easier for inventors to acquire lenses of differing sizes and shapes, and to experiment with different lens combinations. The earliest telescopes and microscopes, then, are borne out of the experiments with lenses made available by the increased production of eyeglasses.

Seeing as both the telescope and the compound microscope are basically the same construction—a set of lenses supported by a tube—it makes sense that they would have been invented around the same time as one another. Though it is arguable that the compound lens system qua microscope predates the telescope by about twenty years or so, the telescope was certainly more of an instant success, firstly, because simple magnification of small objects was less of a novelty, as suggested above, and secondly because telescopy was, Wilson writes, "obviously useful in affairs of the world," especially for warfare and navigation, while "being able to see small was not" (75). The many descriptions of the usefulness of optical devices lacing the pages of Bacon's *Opus Majus* are frequently followed by proposals of their strategic employment.[19] Van Helden

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which make for good vision" (qtd. in Davidson 3), giving historians a sense of the period from which they originated. The grave of Salvano d'Aramento degli Amati, a Florentine nobleman who died in 1317, includes a statement that he invented spectacles, but that he kept the secret of their manufacture, and the tomb of Alessandro della Spina of Pisa, who died in 1313, includes a similar inscription, that he "discovered how to make spectacles (possibly from Amati), and made the method known" (Clay and Court 5). "With this concentration of evidence," writes optical historian D.C. Davidson, "it is generally conceded that European spectacles were invented in Italy about the end of the thirteenth century" (3-4). Davidson reports that the Museum of London has a pair of early "rivet spectacles" dating from before 1440, and that spectacles made from a single piece of leather, used "from about 1500 to well into the seventeenth century" (4), have been found in Boston, Lincolnshire. Earlier Chinese spectacles were "originally made from a dark transparent material," Wilson writes, "while in Europe they were made from "beryl (hence the German *Brillen*, spectacles), or rock crystal" (73).

[19] Bacon suggests, for example, that through the construction and placement of mirrors, a single army can be made to appear as several, or that a small army might appear very large. He also contends that Julius

agrees, arguing that "[t]he telescope remained first and foremost a terrestrial instrument, used for spying on the enemy from a distance or identifying a ship when it was far away" (43). But perhaps the most striking reason for the telescope's initial popularity was its motivation for what Freeman Dyson calls a "tool-driven revolution," as opposed to the more recognizable "concept-driven revolutions" associated with the names of Copernicus, Newton, and Einstein.[20] There is little debate that when users of the telescope eventually turned their gaze towards the heavens, instead of the enemy's shoreline, what they saw, and what they concluded, shook the foundations of geocentric models of the universe by revealing the "retrograde motions of the planets," and displaying their "approaches toward and recessions from the earth" (Westfall 11), thereby offering empirical support for the Copernican system. In this way, the instrument played a vital role in the developing scientific revolution, and as such, the telescope, more so than the microscope, was "presented as an agent of revolution in physics and natural philosophy" (Wilson 75), garnering greater attention as it generated a more widely spread and controversial paradigm shift.

Despite its telescopical overshadowing, instrument users eventually returned their gaze from the heavens back to the earth, taking up the microscope to do so, and though historians are unable to determine who, precisely, invented the microscope, "there can be no doubt," write Clay and Court, that by the first quarter of the seventeenth century, opticians "had succeeded in interesting the scientific world in the possibilities of the microscope as a philosophical instrument" (18). As mentioned above, the majority of histories of the microscope tend to focus on inventor biographies, rather than on the more forceful, philosophical polemics associated with microscopical discoveries. Schickore emphasizes that, in addition to biographical accounts of microscopy, histories appearing in the 1960s and 1970s were often "technically oriented," where authors merely detail the

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Caesar had "erected very large mirrors" during his attempt to subdue England, "in order that he might see in advance from the shore of Gaul the arrangement of the cities and camps" (580-1), a strategy that is clearly telescopical.

[20] See Freeman J. Dyson, "Two Revolutions in Astronomy." Here, Dyson claims that besides the "five major concept-driven revolutions" occurring throughout the last five hundred years—those associated with Copernicus, Newton, Darwin, Einstein, and Freud—there have been "about twenty tool-driven revolutions," which he describes as "not so impressive to the general public but of equal importance to the progress of science" (1).

mechanical parts of the microscope, illustrating alterations made to its "screws, stand, and tubes" (16). Such accounts lead to the misperception that any progress made with the microscope is to be confined to discussions of its design, instead of its role in "the context of the intense discussions about the linked problems of epigenesis and preformation, spontaneous generation, and the existence of organic molecules" (17), to which I would add the reevaluation of physico-theological and metaphysical categories of being.[21] It is this discussion and way of thinking about the microscope that my analysis of it—as a thing that embodies and preserves thoughts in conversation with a number of discernible polemics—enters.

By the early seventeenth century, then, the microscope had become fairly well known to the European scientific community, giving life to what became its "golden age," a period of microscopical activity that produced what Wilson calls the "first generation of microscopists," along with landmark titles like Hooke's *Micrographia* and Leeuwenhoek's "Observations concerning Little Animals."[22] Scientists such as Jan Swammerdam, Henry Power, Robert Boyle, Nehemiah Grew, Marcello Malpighi, Pierre

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[21] Problems of optical aberration were thought to be insurmountable. Consequently, most instrument makers focused on improving mechanical features of the microscope instead of its lens systems. Not until the early nineteenth century, with the introduction of the achromatic microscope, did the science resume its advanced investigations, triggering the nineteenth century "revival of microscopy," and drawing attention to this period as "crucial for the microscope's establishment as a research tool" (Schickore 1). The achromatic microscope is addressed below in relation to Emerson's early association with the instrument and the science.

[22] This period likewise witnessed significant advancements made to early versions of the compound microscope: Cornelius Drebbel constructs the first twin convex lens microscope sometime between 1619 and 1622; tripod bases are introduced for hands-free observation; focusing devices are tested and improved, like Johannes Hevelius's fine-pitch thumbscrew or "Hevelius's Fine Adjustment;" draw-tubes for greater magnification and novel systems for mounting objects are here discovered. Robert Hooke included a ball-and-socket joint on his microscope, allowing the body of the instrument to be inclined. By bringing it into a horizontal position, the instrument could, for the first time, be used to observe transparent objects. One significant development is attributed to René Descartes, which he describes in his 1637 treatise on optics titled *La Dioptrique*. Here Descartes reports his invention of a metal reflector attached to a microscope that faces the object in order to illuminate it. This reflector was later adapted and re-invented by Anton van Leeuwenhoek, and then again in 1738 by Johann Nathanael Lieberkuhn, who successfully attached his name to it. The "lieberkuhn" is now a recognized feature of the microscope, first referred to as such in Benjamin Martin's 1776 description of his "Universal Microscope," where he speaks of a "concave speculum or *lieberkuhn* (see Clay and Court 139). Descartes also includes in *La Dioptrique* a "Giant Microscope," which many would initially regard as a telescope due to its mounting and large size, but the optical engineering of the instrument, consisting of a bi-convex eye-lens, a plano-convex objective, and a condensing lens in instrument's axis, determines it as a microscope. In fact, Clay and Court go so far to say that "This illustration is, we believe, the earliest known drawing of a compound microscope" (14-5).

Borel, Christiaan Huygens, Hooke, Leeuwenhoek and William Harvey—who had discovered blood circulation in 1628 as described in his *Treatise on the Motion of the Heart and Blood*—along with philosophers like René Descartes, Gottfried Wilhelm von Leibniz, Baruch Spinoza, and John Locke, became increasingly attentive to the world of minutia.[23] The first prime subjects for observation were insects, usually the ubiquitous flea, but between 1640 and 1690 the range of investigations widened greatly. Wilson lists some of these objects, writing,

> Leeuwenhoek looked at semen, blood, milk, bone, hair, spittle, the brain, sweat, fat, tears, sap, salts and crystals, protozoa and parasites, sponges, mollusks, fish, spermatozoa and embryos, pores and sweat, and muscle fibers. Grew specialized in plant parts; Malpighi, the most methodical, studied the kidneys, the lungs, the gall, the brain, fat, and bone marrow, as well as chicken embryos and the fine anatomy of insects, particularly the silkworm. Swammerdam, in his short career, was drawn mainly to insect anatomy and metamorphosis. (85)

The Royal Society, founded in 1660, included microscopy as a premier subject for scientific investigation, inspiring what might be called a "microscopical turn" of intellectual pursuits. Less occupied with "the luminous and remote objects of celestial mechanics," the Society instead concerned itself with "scrapings, bodily fluids, bits of earth, and fragments of tissue" (Wilson ix).[24] It was through the Royal Society that Hooke's *Micrographia*, perhaps the most recognizable work associated with the "golden age," was produced. In fact, *Micrographia*, with its numerous finely detailed illustrations—his engraving of the louse shocked readers, especially as it would be folded out of the folio at about four times the book's size—its speculations on color and light, and its lengthy philosophical preface, became the Society's first best-seller.[25] Hooke's

[23] When talking of Descartes's contributions to optical theory, Leibniz had mockingly suggested that his designs for "magnifying glasses with which we could see animals on the moon and all the finer parts of creatures" were, according to Wilson, "that philosopher's greatest and most substantial achievement, by contrast with his absurd and imaginary metaphysics" (qtd. in Wilson 78). Wilson also refers to Swammerdam, Leeuwenhoek, Grew, Hooke, and Malpighi as the "five classical microscopists" (67), and thus as the chief microscopical authorities during the instrument's "golden age." See also Martin Jay, *Downcast Eyes: The Denigration of Vision in Twentieth-Century French Thought*.

[24] See also Wilson 86.

[25] A German summary of Hooke's *Micrographia* appeared two years after its initial publication and the *Journal des savants* reviewed it a year later, in 1668. It was positively received throughout European scientific circles: Huygens praised it in a letter he wrote to Robert Moray, and Leibniz is said to have persistently sought out a copy for himself, which he finally obtained in 1678. The only major criticism

work displays the increased interest in microscopy that resulted from the examinations by the first generation of microscopists. Their investigations of blood circulation, procreation, and anatomy, their discovery of animalcules and cells, their theories of color and light, and their descriptions of the surface of things—where homogeneity was expected and irregularity was found—set forth a number of hotly contested disputes in nearly every sphere of natural philosophy, science, and theology. In these and other debates, the microscope's influence cannot be overstated.[26]

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seems to have come from Leeuwenhoek, whose first contact with the Royal Society regarded his evaluation of some of the *included* drawings, especially the representation of the bee's eye. "His success," writes Gerard L'E Turner, "was instant, and also far-reaching, for it established the popularity of the microscope with generations of observers, and this in turn … ensured that it was manufactured in quantity and steadily improved in design" (124). His primary objects of study included insects, especially fleas, lice, flies, moths and bees. Hooke also looked at plant materials, like mold, moss, and fungus, and inorganic materials such as the sparks in pieces of flint, the point of a fine needle and the edge of a razor, different forms of glass, and, of course, the cork of observation 18, famous for Hooke's description of "little boxes or cells," that coined the term for the basic unit of life. See especially Wilson 87-8, and Clay and Court 20.

[26] Though Hooke did not make his own microscopes, he did direct instrument makers like Christopher Cock of London to develop several optical and mechanical features that vastly improved its design. Some features that Hooke's microscope embraces for the first time include draw-tubes, a moveable object-holder, the ball-and-socket joint, and a new illuminating system. The four draw-tubes attached to Hooke's microscope consisted of inner sliding mechanisms allowing users to adjust the tube length for better focusing and greater magnification. The object-holder was basically a spike held by a short pillar and attached to a rotating disc. The disc was held in position by a link and butterfly nut that could be placed in nearly any position by a series of combined movements (Nelson 335). The ball-and-socket joint, as referenced above, could be used to incline the body and thereby allowed for the magnification of transparent objects. For illumination, Hooke attached a liquid filled globe that could project the flame of an oil lamp directly onto the specimen. Another significant feature of Hooke's microscope is the adaption of the field lens. Though Hooke may not have invented this modification himself, Balthasar de Monconys claimed it in 1660, he certainly applied it to his microscope to help correct certain aberration problems (Nelson 335). The field lens has since become a method by which to date early microscopes, as since its description in *Micrographia*, nearly all microscopes included them.

Hooke's microscope set the standard for the instrument, which remained basically unchanged for the next one hundred years. The other great influence on microscopy during its golden age was Leeuwenhoek. Unlike Hooke, Leeuwenhoek did make his own microscopes, hundreds of them, and all for personal use (Ruestow 10). And though he was eager to share his discoveries with the public, he was equally hesitant to divulge his methods. The Royal Society's fervor to examine Leeuwenhoek's microscopes was motivated by their guiding principle that endorsed the free exchange of scientific information; yet their fervor was matched by Leeuwenhoek's defiance. Wilson characterizes Leeuwenhoek's position when she writes, "He seems to have seen that, because he lacked education, breeding, and a footing in the learned world, a revelation of his methods would have made him superfluous" (91). The Royal Society could not tender Leeuwenhoek a publication offer, since he did not really have a formal treatise to present, and Leeuwenhoek was already of a somewhat guarded disposition, writing once of his own personality, "I do not gladly suffer contradiction or censure from others" (qtd in Wilson 93). Keeping secret his methods, his best lenses, and his manufacturing techniques was his way of protecting what he saw as his only capital, and publicizing his considerable discoveries kept interest in this capital high. Leibniz had even suggested to Leeuwenhoek that he open a school, but as distrustful of others as he was, Leeuwenhoek declined, fearing the consequences of teaching others his techniques (Wilson 92).

Little Things, Big Problems

Historians of optical technology have demonstrated much concerning the manufacture of the microscope, from the dissemination of optical theory across the globe to the alterations of specific mechanical features that had gained or lost user interest. Though these microscopical histories have provided a more comprehensive understanding of the instrument's influence on scientific and visual practices, many neglect to interpret the microscope as an object shaped by underlying motivations. A relevant study that I think helps one begin to understand what these motivations may have been is Martin Jay's work concerning ocularcentrism. In many ways, the microscope appears to have been borne out of ocularcentric tendencies; however, I argue that the microscope eventually subverts the very "perspectivalist tradition" (435) that gave rise to it, and, by extension, ultimately undermines conventional metaphysical hierarchies dependent on what Jay would define as ocularcentric ideology.[27]

"Whether or not one gives greater weight to technical advances or social changes," Jay asserts, it is nonetheless "evident that the dawn of the modern era was

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Leeuwenhoek's exhaustingly detailed observations of bee stings, water preparations, muscle fibers, plaque from his own teeth, etc., won him significant celebrity, especially due to his discovery of microscopical organisms, or the "little animals" known as animalcules. The discovery of animalcules would forever change science, helping first to discern the field of biology, and then to shift general interest to this field. Animalcules in semen, for example, prompted a revisioning of generation, where the theological systems that defined the metaphysics of human production came under fire as untenable under the microscope.

Leeuwenhoek preferred the simple microscope to the compound, which is the type associated with the greater part of the critical work carried out during the golden age to the nineteenth century (Clay and Court 32). His chief accomplishment came from the employment of smaller lenses, rather than from lens combinations, as he recognized that the power of magnification was a function of lens size. He was also the first to use a bead lens to observe transparent objects (Ruestow 152). While his microscopes appear incredibly simplistic, often lacking body tubes, focusing sliders, and other additional features, it is noteworthy that he achieved a level of magnification far superior to his contemporaries. According to Brian J. Ford, even as late as 1985 modern equipment could give results only about four times as powerful as Leeuwenhoek's original simple microscopes (4). Due to his secrecy, and the fact that so few of his microscopes survive, it is difficult to determine precisely how greatly Leeuwenhoek's work influenced the microscope from a design angle, and advancements in microscope construction that developed throughout the seventeenth and eighteenth century tend to reflect Hooke's instrument as described in *Micrographia* more so than those of Leeuwenhoek.

[27] Jay first becomes suspicious of the ocularcentrism sustaining Western thought retroactively; he noticed a regular dismissal of vision throughout twentieth century critical theory and philosophy, and worked his way back to locate the roots of this antiocularcentrism. The microscope, I argue, will similarly undercut the traditional favoring of vision and, as such, may serve as a precursor to the eschewal of visual bias that Jay finds so prevalent in the twentieth century.

accompanied by the vigorous privileging of vision" (69). Though ocularcentrism may have reached its apotheosis in the modern era, notably through movements associated with the scientific revolution, in Jay's account the esteem granted to sight as the "noblest of the senses" begins much earlier, as classical Greek religion, theatre, and art each sustained ocularcentric interests.[28] The Greek "celebration of sight" seems especially dominant, Jay continues, "in that remarkable Greek invention called philosophy" (24). The concept of an eternal presence—of an existing realm of things timeless, uniform, unchanging, and perfect that conditions much ancient Greek philosophy—could be said to depend on the idolization of vision. Jay summarizes the philosopher Hans Jonas to clarify how preference for the visual informed early metaphysical philosophy:

> Sight … is preeminently the sense of simultaneity, capable of surveying a wide visual field at one moment. Intrinsically less temporal than other senses such as hearing or touch, it thus tends to elevate static Being over dynamic Becoming, fixed essences over ephemeral appearances. Greek philosophy from Parmenides through Plato accordingly emphasized an unchanging and eternal presence. (24)

Jonas claims that the very idea of a Formal metaphysical realm is one intimately tied to the organic experience of sight, and as such provides the philosopher with a means of discovering reality. Even when Plato appears critical of sight—warning against the dangers of visual deception, mimetic art, and the shadows on the cave wall—he nonetheless sustains the visual bias by simply relocating it to the soul, the seat of reason, as the "mind's eye." Take, for example, Socrates's dialogue with Glaucon in book VI of *The Republic*, when, after allegorically linking the Good with the sun, and the sun with sight, he says:

> When the mind's eye rests on objects illuminated by truth and reality, it understands and comprehends them, and functions intelligently; but when it turns to the twilight world of change and decay, it can only form opinions, its vision is confused and its beliefs shifting, and it seems to lack intelligence. (qtd in Krook 133)

This passage not only demonstrates Plato's veneration of the metaphysical realm of Being (the world of truth and reality, the realm of Forms) over the physical realm of

[28] Greek gods, Jay argues, were "visibly manifest to human kind," and encouraged their plastic depiction by Greek artists, who aimed to realize the "perfection of idealized visible form" (23) in their works.

Becoming (the world of change and decay, lacking intelligence), but consequently the nascent hierarchy whereby sight is simultaneously idealized as the mind's means of apprehending Being. Such references to sight as the privileged connection between the mind and the Forms are found throughout *The Republic*, as when Socrates posits that "the things themselves … can only be seen with the eyes of the mind" (Jowett 207), or when he defines the philosopher as he whose "mind is fixed upon true being," whose "eye is ever directed towards things fixed and immutable" (Jowett 195).[29]

In Jay's account, the ocularcentric tradition develops into what he calls the "great technical innovation of the Renaissance art," or the "invention … of perspective, the technique for rendering three-dimensional space onto the dimensions of the flat canvas" (51). Whereas medieval paintings lacked depth perception, presenting the viewer with multiple vantage points, Renaissance painters routinely employed a single perspective—a "monocular, unblinking fixed eye," or abstract point of view—that effectively made the beholder the "privileged center of perspectival vision" (54). Each point of the painting could be surveyed simultaneously by a bracketed viewer/subject, who could now assume a static and unchanging view; the "visual world" was now replaced by a "visual field," a "homogenous, regularly ordered space, there to be duplicated by the extension of a gridlike network of coordinates" (57). The result, Jay claims, was the legitimation of surveillance, of "probing vision" (65), enacted by scientists who thought of their inspections as pure observations of a readily given and ordered natural world. The "discovery" and employment of perspective by Renaissance painters may have

[29] In Jay's account, the ocularcentric tradition instituted during the ancient and Hellenic ages later expanded with the dissemination of Christianity. Though he admits that a trend of ocularphobia developed within the church throughout the Middle Ages, perhaps reaching its peak with early Reformation iconoclasm, he argues that on the whole Christianity's "faith in the corporeal incarnation of the divine in human form" led to a prevalent "belief in the visible sacraments and the visible church" (36), a belief realized in the construction of light-filled churches, the bodily metaphors of the Eucharist, the raising of the consecrated host for worshipers to see, and the trust given to beatific visions (36-7, 39). In addition to the incorporation of Platonic thought into Christian doctrine, thereby continuing the heritage of visual bias, manifestations of ocularcentrism served a more practical purpose to medieval theologians; before the expansion of mass literacy mentioned above, the church, "knowing the power of visual stimulation" (Jay 40), sought to make the "Christian story available to the hoards of new believers from non-Jewish backgrounds" (Jay 36), and did so by means of non-textual images. As Jay argues, "[i]n a society still overwhelmingly unable to read, the veneration of images was a useful tool in educating the faithful," and thus "[t]he widespread use of stained glass, bas-reliefs, frescoes, altarpieces, wooden carvings, and so on, to tell biblical stories" (41) allowed the church to effectively spread its authority.

heightened the dominance of ocularcentrism, consequently preparing the way for a new scientific order and its interest in instrumentalized extensions of seeing. That is to say, if one accepts Jay's argument concerning ocularcentrism, that a heritage of Platonic metaphysics dependent on visual stasis may have conditioned experiments in perspectival aesthetics that then prompted an increased interest in optical instruments like the microscope.

"In the early and mid-seventeenth century," writes Catherine Wilson, "Western Europe was the site of theoretical and technological achievements" like the widespread acceptance of the Copernican system, the founding of important scientific societies, and the regular use of "[i]nstruments for the observation of the very distant or very small objects" (3). These "technological achievements," Jay would argue, are predicated on the "aesthetic achievements" of Renaissance artists who made visual space into an "ordered, uniform system of abstract linear coordinates" that would later prompt scientists to conceive the world as an "eternal container of objective processes" (52-3), one that may be monitored, discerned, and organized by means of scientific observation. Wilson's characterization of the early modern scientist may be augmented by Jay's account of ocularcentrism; according to Wilson, the scientist is one who recognizes that "[t]he world is not there to delight us," one who

> unmasks the delusions of self-indulgent human consciousness and replaces them with the hard facts: nature in itself is morally and aesthetically neutral, neither benevolent nor cruel, neither beautiful nor ugly. In place of a sympathetic cosmos … we have only one kind of matter forming one pattern … little structures and machines producing all the illusions of subjectivity. (17-8)

To mediate the direct observation of the world with "the delusions of self-indulgent human consciousness," that is, emotions, morality, beauty, divinity, etc., is to decentralize the ocularcentric, to interject the non-visual into the visual field and thus to obscure the viewing of the orderly structured and gridlike network that is nature. The early modern scientist had to, Wilson claims, assume an objective stance by first assuming that the world is there to be *seen*.

And yet to mediate direct observation with optical tools was not only accepted, but broadly encouraged. Instruments like the microscope and telescope, meant to extend the range and power of sight, were regularly portrayed as remedies to the frailty of human sense-organs. Hooke provides a telling description in the preface to his *Micrographia*,

> As for the actions of our Senses, we cannot but observe them to be in many particulars much outdone by those of other Creatures, and when at best, to be far short of the perfection they seem capable of : And these infirmities of the Senses arise from a double cause, either from the *disproportion of the Object to the Organ*, whereby an infinite number of things can never enter into them, or else from *error in the Perception*, that many things, which come within their reach, are not received in a right manner. (i-ii—Hooke's emphasis)

Hooke does not lack faith in the veracity of the eye, but posits that, with the aid of optical instruments, it can be made to fulfill the perfection of which it is capable. Proper perception of the world is determined by proper adjustment of the optical apparatus—allowing it to receive the world in "a right manner"—which may include correcting the disproportion between the eye and its object, a feat seemingly made available by achievements in microscopy. Whereas the microscope might have served as evidence confirming the deficiencies of the senses, it was instead welcomed as an avenue towards the "enlargement of the[ir] dominion" (Hooke iii). "By the means of Telescopes," Hooke continues, "there is nothing so far distant but may be represented to our view; and by the help of Microscopes, there is nothing too small, as to escape our inquiry" (iv). By extending the range and power of the ocular apparatus, the microscope, when thought of as an instrument of ocularcentrism, may have elevated what Jay calls "the mainstream scopic regime" (103) of early modernity.[30]

"Golden age" microscopists were undoubtedly motivated by this truth-revealing potential of the instrument, as a "perfected" optical apparatus would allow the eye to view its most sought after object, now made proportionate: a perfect eye could see a perfect object, and to see perfection would be to see the *to ti esti*, the "what-it-is," the "essence" of that beneath its lens. Armed with this instrumental means of visual perfection and encouraged by their ocularcentric culture, pioneering microscopists maintained ambitious goals as they sought to "make visible the ultimate structures of the

[30] Though the privileging of sight may have reached its height in the early modern period, the "scopic regime" it advocated was certainly not without its detractors. Jay names Jean-Jacques Rousseau, Denis Diderot, and Jacques Louis David as particularly skeptical of traditional ocularcentrism, but characterizes them as fighting a losing battle against visual favoritism. See especially Jay 90-105.

animate and inanimate world" (Shapin 1517), thus allowing them to locate and read the underlying "alphabet of nature, the alphabet of simple forms" (Wilson 229). The microscope, Hooke reasoned, could "take us down to the realm of philosophical essences," could display the fundamental order of the world as corresponding to its gridlike structure, and could reveal "the uniform and ubiquitous operation of laws of nature" (Wilson 218, 178). Following this line of thought, that the microscope embodies a possible heritage of ocularcentrism, one might imagine the "alphabet of simple forms" sought by early microscopists as figured by the Greek conception of formal essence. Platonic through and through, the most intimate and fundamental structures of the world would be ordered, homogenous, complete, and perfect.

But this is not what microscopists like Hooke and Leeuwenhoek found; clearly organized structures of distinct and smooth surfaces gave way to an irregular landscape of erratic discontinuity; the invisible world as revealed by the microscope did not appear to resemble the visible world in the least, despite the use of everyday language—terms like "ropes, fibers, globules, forests" (Wilson 62)—necessary to describe it. When placed beneath the lens, objects looked exotic, alien, strikingly and mysteriously different from their unaided view, and irregularity, *not* perfection, became their defining characteristic. "The irregularity of objects seen under the microscope," according to Wilson, generated "an argument against the Aristotelian theory of homogenous substance" suggesting that "the perceived continuity of substances is due to a perceptual blurring of the little mountains and valleys on a surface" (57-8), not a formal, essential reality giving rise to the world of semblant objects. "The uniformity of a piece of metal," Wilson continues, "is as illusory as the uniformity of a sheet of paper or a piece of woven cloth," and both "reveal their irregularity under the lens" (58). Smooth surfaces do not exist as such, and things are not distinctly given.

Moreover, as instrument makers expanded the microscope's range through mechanical developments, so expanded the confusion. Not only were seemingly smooth, homogenous surfaces revealed as illusory, but the discovery of "little animals" inhabiting the "little mountains and valleys" were no less shocking to those who first eyed them. The construction of the "aquatic microscope" allowed early microscopists to follow the movements of animalcules as they swam about, and offered a means for observing the ecology of the smallest forms of life.[31] For many, the manner of behavior there witnessed was anything but rational. The naturalist John Hill, for example, was appalled by the feeding habits of zoophytes viewed through the microscope, and described what he saw as "such a science of Butchery, so universal, so varied, and so hurried in all its parts, human cruelty itself never offered" (qtd in Wilson 210). Emerson would repeat Hill's sentiment nearly a century later, writing, "[t]he microscope reveals miniature butchery in atomies and infinitely small biters, that swim and fight in an illuminated drop of water" ("War" *W* 11:154). Instead of an orderly realm of formal essences, the microscope displayed a base, naturalistic chaos existing just beneath the threshold of perception.

Classical microscopists, who once thought that the microscope could reveal "the realm of philosophical essences," discovered instead that nature was far more elusive and chaotic than anticipated, that is was hardly conformable to any distinct perspectival grid. In this way, the microscopical view appears to more closely resemble the Baroque than it does the Renaissance. Consider Jay's summation of French philosopher Christine Buci-Glucksmann, who "celebrates the disorienting, ecstatic, dazzling implications" of Baroque visual culture:

> For Buci-Glucksmann, herself espousing many of the antiocularcentric discourse's conclusions, it is precisely the baroque's subversion of the dominant visual order of scientific reason that makes it so attractive in our postmodern age. Anti-Platonic in its disparagement of lucid clarity and essential form, baroque

[31] Instrument makers like George Adams and Benjamin Martin were advancing microscope design by experimenting with combinations of newly developed mechanical components. As mentioned above, few optical improvements were made to the microscope from Hooke to the introduction of achromatic lenses, so makers concentrated on the microscope's non-optical features. Of these, the "aquatic" microscope stands out. A problem that the first generation faced when observing anatomical segments or animalcules was that dry preparations revealed little; a "specimen," writes Wilson, "had to swim in oil or water to show its structure" (84). However, when the "little animals" would swim, they tended to move out of focus. "Aquatic" microscopes represent an attempt to solve this problem, as the term refers to a movable horizontal arm holding the objective, or the magnifying lens, that could be used to follow the specimen as it swam. Leeuwenhoek had designed an "aquatic" microscope intended for wet preparations as early as 1722, and makers like Martin, Adams, and John Cuff later standardized it (see Wilson 83, and Clay and Court chapter nine). The copyright to Adams's instruments was eventually sold to William and Samuel Jones in the late eighteenth century by his son Dudley. The Jones brothers then produced a number of popular, though expensive, microscopes that they advertised as the "Improved Microscope" and the "Most Improved Microscope," which Clay and Court characterize as the "final development of Cuff's original microscope" (201). These devices became some of the most famous of their time, and were continually re-produced until the mid-nineteenth century.

> vision celebrated instead the confusing interplay of form and chaos, surface and depth, transparency and obscurity. Sensitive to the interpenetration of the discursive and the figural … it registered an awareness of the impurities of both that was greatly in advance of its time. Resistant to any totalizing vision from above, the baroque explored what Buci-Glucksmann calls "the madness of vision," the overloading of the visual apparatus with a surplus of images in a plurality of spatial planes. As a result, it dazzles and distorts rather than presents a clear and tranquil perspective on the truth of the external world. Seeking to represent the unrepresentable, and of necessity failing in this quest, baroque vision sublimely expresses the melancholy so characteristic of the period. (47-8)

If one considers the microscope as a production of ocularcentric motives—generated by the wish to *see* the essential structures of the world—or as an embodiment of the seemingly limitless power ascribed to vision—that would allow the viewer to witness essential form with lucid clarity—then the instrument becomes a paradox: by pushing vision to its extreme, by "perfecting" vision, the microscope ends up undermining the very motivations that gave rise to it. What faced microscopists, according to Wilson, was the "absolute unintelligibility of the structures perceived" (230), a challenge that could not be solved regardless of how far microscopical science advanced: "Greater magnification, a sharper image, more convenient microscopes do not seem to be the answer: more images amount to more mystification" (231). Peering through the microscope at increasing levels of magnification does not offer a "clearer" or "more tranquil" perspective on the truth of the external world, it simply offers more dazzling and distorting perspectives, more structures that phenomenally come into view and, just as quickly, disappear. The ocularcentric notion that nature is organized and readable by means of the proper positioning of the ocular apparatus seemed indefensible: nature is not a book, and it cannot be read as such. Indeed, the microscopical eye is one that, as Poe has written, appears to "struggle in vain."

Perhaps the "absolute unintelligibility of the structures perceived" through the microscope, the disclosure of an impossibly irregular landscape contradicting the notion of formal essence, is why golden age microscopists seemed more interested in the design and construction of their instruments than in their use. Perhaps this is why, as noted above, scientific instruments like the microscope were often kept as status symbols rather than actively employed to explore the world, and why, as the microscope became increasingly popular throughout the seventeenth and eighteenth centuries, instrument makers tailored their devices for a more genteel market.[32] In any case, the microscope's inability to display the uniform operations of nature's laws led classical microscopists to give up, a possible sign of an impending loss of faith in ocularcentric ideology. Peaking in the early 1680s, works based on microscopical observation and research quickly declined. Hooke felt that "all the important microscopical discoveries have already been made," and that the microscope seemed more suited to amateurs wielding the instrument as a toy with "no particular interest either in enlarging the field of microscopical research or in settling controversies with its help" (Wilson 227). Boyle, too—who once suspected that if we "had such perfect microscopes," then "our promoted sense" could discern how the "little protuberances" (680) composing an object's surface might reveal the essence of color—abandoned the project, and later "despaired of understanding surface effects with the help of an underlying alphabet of forms" (Wilson 229), the reading of which was promised by the microscope. The microscope's inability to display an underlying

[32] According to Marc Ratcliff, the largest influence on the production of scientific instruments, outside of the needs of scholarly researchers, was a demand for "more impressive and highly ornamented devices to please a new aristocratic audience" (82), a point Clay and Court confirm when they write, "[p]robably most of the instruments were intended for pleasure of the leisured class who desired to use them to interest and amuse their guests" (127). Beauty of design regularly trumped functionality, as microscopes with intricate engravings and bodies composed of precious metals flooded the market. During the latter part of the seventeenth century, with the creation of the Royal Society and the great patronage of Charles II, scientific pursuit became a thing to do for men of wealth and position, who tended to appreciated beauty of design over actual use. While screw-barrel type microscopes built by Edmund Culpeper, for example, received some scholarly acclaim for its inclusion of a mirror always placed in the optic access attached to the platform, its popularity likely arose from its looks rather than its function (see Clay and Court 127). Culpeper microscopes, with their wood and shagreen bodies, could be beautifully and artistically finished, sometimes elaborately ornamented, which Clay and Court suppose was "no doubt a result of the influence of the seventeenth century engravers, with whom he may have commenced his career" (115, 127). The aestheticized microscope may have reached its zenith with George Adams's 1761 instrument, made for King George III. Adams, who had proudly received the title "Instrument Maker to the King," a title he inscribed onto nearly all of his devices, had built a microscope so elaborately decorated that it was practically inoperative as a scientific instrument. Inspired by classical Greek statues—the origins of Western ocularcentrism—the microscope is built on and around a silver-cased Corinthian pillar, nearly thirteen inches high, and includes on both sides two shorter pedestals, each carrying an ornamental vase, separated from the main pedestal by intricate silver tubing. The feet on both sides of the peripheral pedestals, intended for stability, are embellished with stylized cherubs and foliage. On top of the central pedestal, two robed figures, a man and a woman, stand facing each other; the woman, in stride, holds out her right arm to the man who grasps it with his left. "This microscope exhibits," write Clay and Court, "the sacrifice of usefulness to ornament. Though perhaps the most artistically and elaborately decorated instrument ever constructed, Adams must surely have been fully aware of its faults as a scientific instrument" (178-9). See also Wilson 67.

rationality manifesting in objects of the visible world was strongly felt by its earliest advocates; as a result, until the appearance of the achromatic lens system in the early nineteenth century, use of the microscope as a serious philosophical tool remained dormant for roughly a century.

Furthermore, the microscope not only subverted ocularcentric/scientific systems of knowing, but also hierarchical metaphysical schemas, theories of physico-theology, and conceptions of primary/secondary qualities that similarly depended on the regularity of a "formal alphabet." The observation of animalcules, for instance, upset the "great chain of being" constructed prior to their discovery; the special creation of each was clearly not a concern before the diverse types had been distinguished and classified. "No one to my knowledge," Wilson jests, "discusses the whereabouts of the animalcula during the Flood, or the problems that would have been involved in marshaling and loading them … [and thus] their existence tended to push the entire idea of a creation under the control of a single being … into absurdity" (209). Moreover, any moral lesson attached to supreme creation was difficult to apply, as these little creatures were hardly comparable to animals of the visible world; they "did not exhibit sagacity, practicality, maternal care, social organization, or anything similar. They moved, swam, ate, and appeared and disappeared as though no one cared about them at all" (209). In this way, attempts to assimilate microscopical animalcules into macroscopical figurative systems demanded reconsiderations of biological classification as they simultaneously challenged faith in the metaphysical and spiritualistic mystery thought to manifest in objects of immediate perception. Pursuing this line of thought further, I argue below that the microscope ultimately revealed the construction of classification systems themselves—biological, metaphysical, semiotic, or otherwise—to be necessarily figurative.

By displaying objects of perception as habitats for microorganisms, the microscope consequently required a rethinking of the "thing" itself; no longer limited by its given semblance, the thing becomes a place, an environment, a microcosmos. In this way, the microscopical view of the thing informed the problem of primary and secondary qualities that was strongly contested throughout early modern philosophy. Descartes, Locke, and Leibniz all struggled with the microscopical, as they could only imagine the newly revealed microworld as arbitrarily linked to the macroscopical; one could not empirically demonstrate a contingent connection between primary and secondary qualities—the telling of time, say, with the face of a clock, down to its inner springs, wheels, and coils, appeared to maintain a muted, differential gap. Accessing the inner mechanism of a clock will not tell you what time it is, just as viewing and isolating the disparate granules of color composing what we see as "green" cannot, as Boyle once hoped, tell us how "green" is seen. Leibniz had observed this impasse in the *Monadology*, where, in the famous "mill" passage, he argues if one were to enter the interior of a machine and examine its working parts, one would find nothing to explain perception (227-8). Locke reaches the same conclusion in the *Essay Concerning Human Understanding*, and references the microscope to posit the fundamental incommunicability that must exist between the visible and subvisible worlds:

> Nay, if that most instructive of our senses, seeing, were in any man a thousand or a hundred thousand times more acute than it is by the best microscope, things several millions of times less than the smallest object of his sight now would then be visible to his naked eyes, and so he would come nearer to the discovery of the texture and motion of the minute parts of corporeal things … but then he would be in a quite different world from other people: nothing would appear the same to him and others … so that I doubt, whether he and the rest of men could discourse concerning the objects of sight, or have any communication about colours, their appearances being wholly different. (403)

Locke here exhibits Jay's assertion of a traditional veneration of sight as "that most instructive of our senses," but quickly acknowledges that discovering the "texture and motion of the minute parts" of a semblant object, while possibly leading to greater knowledge of that object, is insufficient to explain one's perception of it; communication between the macro and microscopical views, the contingent relationship therein, is indiscernible.[33] As will be further explored in my reading of Peirce below, the gap between primary and secondary qualities became wider and more complex when philosophers explored the microscopical perception of things.[34]

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[33] For an interpretation of Descartes's take on the distinction of primary and secondary qualities in regards to vision, see Jay 77.

[34] In chapter two, I hope to show why Peirce would likely argue against early modern critics who claim that the microscope cannot offer any solutions towards understanding the connections between qualities, by

What my study of the microscope's underlying motivations is especially concerned with, however, is how the instrument plays into the philosophical tradition of privileging the whole to the particular. The history of philosophy has long suppressed the minute in favor of the whole to better maintain a hierarchical metaphysical schema. But, by localizing, extracting, and emphasizing the particular, the microscope produces a mode of viewing that necessarily dismisses the whole, consequently promoting an explicitly anti-idealist means of perception. The microscope thus transposes the conventional relationship between particular and whole, and further unsettles the faith given to notions of *a priori* essence and systems of metaphysical categorization. The tension between the particular and whole will be felt throughout each subsequent chapter as I demonstrate how the rise of the microscope parallels the rise of particularity as first metaphysics, how the changing status of this classic philosophical dialectic is closely tied to the influence of the invisible world newly made visible. The microscope is always subversive as it instrumentalizes this tension and preserves the disruption of sensation. It undermines faith in *a priori* essence, metaphysical and spiritualistic categories of being, and it does so by pushing vision to its extreme.

Transatlantic Microscopy: Winthrop, Mather, and American Alchemy

While the origin of the microscope's invention remains a matter of dispute, it is fairly well established that its introduction to England is rightfully credited to the Dutch inventor Cornelius Drebbel. Through his association with Albert, an Archduke of Austria, Drebbel had obtained an early Jansen microscope that he brought with him to England when he and his family moved there around 1604. His improvements to Jansen's microscope were recognized throughout Europe, as were his creations of a "perpetual

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suggesting that the problem is not so much with the means of observation made available by the microscope but with the poor condition of inductive logic, the development of which has been traditionally suppressed by the Platonic overestimation of deduction borne out of idealist conceptions of the whole. In this way, one may speculate that Peirce thought of much early modern philosophy as products of, and limited to, deduction as the chief mode of philosophical reasoning, thus resulting in their resistance to microscopy. Additionally, in chapter three, I will attempt to demonstrate how the muted, differential gap, itself paradoxically magnified by the microscope as the viewer transitions between different levels of magnification, provides a means of understanding a Melvillean theory of symbolism.

motion" machine and, most notably, the first navigable submarine in 1620.[35] The latter invention eventually landed him a position with the British Admiralty, and, surprisingly, to his ruin. While employed by the King's Navy, Drebbel made floating mines intended to set fire to the French fleet at La Rochelle. Though the first mine proved effective, all the rest were harmlessly scooped from the surface of the water, resulting in ridicule leveled at King James, who quickly dismissed Drebbel from service. He died relatively poor, eking out a living as an Ale-house owner below the London Bridge (Lewis 252).[36]

Joining Drebbel at La Rochelle was a young man named Abraham Kuffler, Drebbel's son-in-law who served with him as an explosives expert in the British navy.[37] These two men form the European abutment of the transatlantic bridge across which the microscope most likely traveled to America. On the other side stands a figure well known to historians of colonial America, the governor of Connecticut and son of the founding governor of Massachusetts, John Winthrop, Jr. As an avid chemist, alchemist, and practical naturalist, Winthrop "exemplifies," according to biographer Walter Woodward,

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[35] See Clay and Court 8-9, and Frederic T. Lewis, "The Advent of Microscopes in America." Archduke Albert was given one of Zacharias Jansen's first microscopes sometime near 1605. Albert had later passed this instrument on to Drebbel, who then brought it with him to London and had showed it to the Ambassador Willem Boreel no later than 1619. The evidence of the exchanges from Jansen to Albert to Drebbel appears in a letter written by Willem Boreel in 1610, and later archived by the king of France's physician Pierre Borel who was collecting affidavits to establish Jansen's claim as the "true inventor of the telescope." By 1624, Drebbel's improvements to Jansen's microscope reached at least as far as Galileo in Italy, and subsequently caused him to abandon work on his own *occhialino*; Drebbel's microscopes had arrived in Rome as early as 1622, and, according to Clay and Court, were by this time "well known and were being made in Holland, England, France and Italy" (12). Drebbel's "perpetual motion" machine was a kind of air thermometer powered by changes in atmospheric pressure.

[36] Drebbel continued to work on the microscope throughout his career, and by 1621, after a visit to Zacharias Jansen, numerous state-of-the-art microscopes, complete with the bi-convex lens system, could be seen at his house in London.

[37] About 1620, while Drebbel was still at the top of his career, two young Dutch brothers—Abraham and Jacob Kuffler—arrived in England, "hoping to be rewarded by King James for a book they had written" (Lewis 251). James, however, did not care to be bothered by the Kufflers, and the pair, "having only a slender means of subsistence" (Tierie 28), sought to earn Drebbel's favor, and thus financial security, by winning the hand of his daughter Anna. The plan succeeded. Anna chose Abraham, who was apparently handsomer than his brother, though less intelligent, and the two brothers began working with Drebbel with great enthusiasm. In 1622, Drebbel sent Jacob to France and Italy to promote his new microscopes, but unfortunately Jacob died from the plague by the time he arrived in Rome. Shortly after, Abraham sent for his two remaining brothers, Dr. Johannes Sibertus and Gilles, and the three brothers became closely associated with Drebbel, helping him to construct his inventions and to promote them across Europe (Tierie 29). Johannes eventually married Drebbel's second daughter, Catherina, and after his father-in-law's death in 1633, sought to perpetuate Drebbel's legacy by forming a company to run a dye works, and by furthering inventions like the thermostatic incubator and a camera obscura.

"the physical and intellectual links that spanned the Atlantic" (1).[38] He held regular correspondence with scientific authorities in Europe, men like Robert Boyle, natural philosopher Sir Robert Moray, and William Brouncker, having become acquainted with them by means of his association with the Royal Society—he was the first American colonist to be elected as a member in 1661.[39] The connection between Winthrop, Jr., Drebbel and Kuffler began sometime around 1627, when Winthrop, who had just returned to England from his schooling at Trinity College, attempted to secure, "a purser's berth aboard a vessel bound for Turkey" (Woodward 31). Though his initial effort to land a maritime position bound for Turkey was unsuccessful, he did obtain one sent for La Rochelle, and during this expedition met both Cornelius Drebbel and Abraham Kuffler. This first meeting led to what Woodward characterizes as a "lifelong friendship" that "helped link Winthrop to many like-minded European practitioners" (32) of scientific pursuits.[40]

Based on the dates of a number of correspondences between Winthrop and Kuffler, and the fact that Winthrop maintained a lifelong friendship with him, it is likely

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[38] Winthrop's numerous contributions to science and engineering include the New England ironworks, charitable promotions of alchemical medical treatments (he became one of New England's most sought after physicians), and methods for vessels to determine their longitude while at sea. Perhaps his most remarkable discovery, as far as this study is concerned, occurred in 1664. Like many other scientists at this time, Winthrop cultured an interest in astronomy, and while observing Jupiter in August with a small telescope, he thought he saw a previously unacknowledged fifth moon, which he subsequently reported to the Royal Society. Shortly after this finding, and believing that a larger telescope would help establish his claim, Winthrop attempted to construct his own "eight-to-ten-foot telescope." See especially Woodward 6, 76, and 290-1.

[39] See Woodward 7 and 193, and Lewis 252.

[40] The friendship is further established by an interesting duodecimo and a selection of letters contained among the Winthrop papers. On the fly leaf of the duodecimo, which contained two works by the mysterious fifteenth century alchemist Basil Valentine published in 1603 and 1624, Winthrop penned the following note:

> This was once the booke of that famous philosopher and naturalist, Cornel. Drebbel, who usually carried it with him in his pockett and after his death was given me by his sonne-in-law, Mr. Abram Keffler. (qtd in Lewis 252)

The note verifies not only Winthrop's connection with the Kufflers, but too his appreciation of Cornelius Drebbel, who, as noted above, was perhaps the most industrious promoter of microscopy during its golden age. Another item of correspondence between Abraham Kuffler and Winthrop is a letter sent to the Connecticut governor in June, 1639, where Kuffler describes his leaving off of "all curious inventissions" to concentrate on the "dieing of scarlett," a profitable enterprise that the Kufflers expanded in the mid 1630s (Lewis 252). Two other letters from Abraham Kuffler's brother Johannes to Winthrop also survive in the Winthrop Papers, written in 1660 and 1662. These letters were received by Winthrop just prior to and during his extended stay in England, which he began in 1661.

that the pair would have met sometime during 1661-3, when Winthrop traveled to England to obtain a charter for the Connecticut colony.[41] It is known that Winthrop had communicated with the Kufflers during an earlier visit to Europe, often using an undeciphered coded language to pass alchemic information they both felt needed to be kept secret (Woodward 83). But this later voyage draws attention because at this time, London, according to Frederic Lewis, "teemed with microscopy" (253). Because of his connection with Drebbel and Kuffler, along with his intense interests in science, chemistry, astronomy, and telescopy, it appears probable that Winthrop would have acquired a microscope at this time, most likely through those who so actively promoted the instrument, and then brought it with him to Connecticut upon his return in 1663.

Winthrop's contributions to science and engineering were largely driven by an underlying ambition; as Woodward explains, "[l]ike many natural philosophers of his age, Winthrop believed he lived in a time of special theological purpose, one in which God had elected to reveal again total knowledge of the natural and supernatural worlds" (1). Alchemy, for Winthrop and his contemporaries, was not primarily concerned with the transmutation of lead into gold. Rather, it designated a "legitimate, multidimensional science that could provide a profusion of benefits" (Woodward 2).[42] Winthrop's scientific activity was primarily motivated by a will to properly prepare the world for the Second Coming, by reconsidering Creation as a chemical process and by devoting himself to the pursuit of knowing God's plan. Along with many of the leading thinkers of his time, most of whom were Puritans, Winthrop shared an understanding that alchemy was a science that, as Woodward explains, "united the quest for useful knowledge with the quest for grace and focused both on the mission to render Christian service to a world reshaping

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[41] Winthrop had traveled to England ostensibly to obtain a charter for the Connecticut colony, which was inhabited at this time by Puritans rumored to be providing refuge to a number of regicides involved with the death of Charles I; their lack of an official charter, which would otherwise lend them some political legitimacy, made the colony even more vulnerable to crown retribution (Woodward 229). Winthrop's influential friends, especially those of the Royal Society, "were instrumental," writes Woodward, "in helping him quickly secure a charter for Connecticut in 1662" (7), with which he returned to America the following year.

[42] As important as the "philosopher's stone," for example, was the "alkahest," a divine elixir believed to cure all diseases that speaks to Winthrop's intense interest in medicine. Aside from these legendary symbols that have come to represent alchemy in general, many alchemists of the period were motivated primarily by spiritual, and not economical, reasons.

itself in preparation for the return of Christ" (27). And so the emergence of novel technologies and scientific devices that appeared in the aftermath of the printing revolution, including instruments like the microscope and telescope, signified to alchemists a divinely mandated opportunity to regain total knowledge of the world that had been lost at the Fall; microscopes were considered tools that could help Christian man in his role of "helping Creation along its providentially pre-ordained way" (Woodward 76). And because of its relation to the ideological discourse informing alchemical science, microscopical knowledge was fought over in terms of its disruption or confirmation of preexisting religious hierarchies.

The alchemical-Christian motivations directing Winthrop's science, and thus his likely acquisition of a microscope in the latter half of the seventeenth century, follow the instrument in its next step towards prevalence in the United States in the work of Cotton Mather. Though the possibility that Mather obtained his microscope through Winthrop is remote—the evidence simply is not available to confirm it—what can be established is that Cotton Mather, who had praised Winthrop as a "Hermes Christianus," a "true adept," likening him to "the Healing Angel of Bethesda" (Woodward 216, 160), was one of the strongest proponents of microscopy in America during its early assumption; Mather cultivated a knowledge of microscopy when American interest in the science, collegiate or otherwise, was hardly common.[43]

While the first part of Mather's *The Christian Philosopher* is clearly devoted to astronomy and the inorganic world, physics and astronomy being the far more dominate sciences of the period, the concluding pages offer what Frederic Lewis describes as "a résumé of gross and microscopic observation of animals and plants, astonishing in scope and penetration" (255).[44] Mather cites a number of important microscopists, including Nehemiah Grew, Marcello Malpighi, Federico Cesi, Lorenzo Bellini, Richard Mead,

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[43] Lewis speculates that the microscope owned by Cotton Mather, that Mather indirectly refers to in 1685, may have been given to him by the Winthrops based on the facts that the two families were in regular friendly contact and that Mather never traveled, according to Thomas J. Holmes, "farther, perhaps, than New Haven" (qtd. in Lewis 253). His father, the Reverend Increase Mather, was more invested in astronomy; he had brought a new telescope from England to Harvard in 1692, and spent many hours with Robert Boyle and John Flamsteed observing the stars (Lewis 255).

[44] For more on the dominance of astronomy, see Wilson 205.

Boyle and, of course, Hooke and Leeuwenhoek, indicating his knowledge of the field. He discusses the separation of the "red Liquor" into "Membranes and Glandules," and the branching of and "communication" among veins and fine vessels carrying blood throughout the body. He compares theories concerning the function of the eye, detailing its minute parts to account for phenomena like the inversion of images and the correspondence of optic nerves to form a single impression.[45]

Bones, glands, teeth, skin: Mather offers his take on the functioning of numerous body parts as observed through the microscope.[46] His purpose, as the title of this or nearly any of his books would indicate, parallels Winthrop's alchemist aspirations: to glorify God by understanding the natural world. As expected, Mather's work is filled with prayers and devotionals to God, like the following passage where he promotes the use of "Glasses," or microscopes and telescopes, as implicitly commissioned by God:

> *Glorious* GOD, I give Thanks unto thee, for the Benefits and Improvements of the *Sciences*, granted by thee unto these our latter Ages. The *Glasses*, which our GOD has given us the Discretion to invent, and apply for the most noble Purposes, are Favours of Heaven most thankfully to be acknowledged. The World has much longer enjoyed the *Scriptures*, which are *Glasses*, that bring the *best of Heavens* much nearer to us. But, tho the *Object-Glasses* are here, the *Eye-Glasses* are wanting. *My GOD*, bestow thou that *Faith* upon me, which, using the *Prospective* of thy Word, may discover the *Heavenly World*, and acquaint me with what is in that World, which, I hope, I am going to. (28)

Present here are the same benefits that Winthrop associated with microscopes and telescopes, as is Hooke's language of making proportionate the object of observation with the God-given human eye. The idea is that knowledge of the minutia composing the natural world leads to greater appreciation of God's plan. This point of view, shared by American scientists like Winthrop and Mather, displays a preventative measure on the part of Christian institutions against secular science to maintain control over an invaluable element of Christian doctrine: the mystery of procreation.[47]

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[45] See Mather 259-260 and 290-1.

[46] In addition to the many microscopical observations Mather includes in *The Christian Philosopher*, the work also contains, according to botanist and historian of science Conway Zirkle, one of the earliest published accounts of plant hybridization. See Zirkle 6-7 and Lewis 256.

[47] It is interesting how Mather's endorsement of scientific instruments takes on a metaphorical nuance in this passage, as he likens the "glasses" to the "scriptures," as bringing the best of heavens nearer to us in

Theories of human generation were widely debated throughout Europe during the years preceding Mather's use of the microscope. Most seventeenth century scientists advocated some version of "preformation" theory, which held that the embryo contains within it all of its rudimentary parts prior to fertilization—that the fetus is somehow "preformed, " that it is "actual," not "potential"—which thus compelled illustrators to routinely include in the pages of early texts on the subject images of fully formed humans existing in the microworld, sometimes concealed in a single spermatozoon, other times, as in the case of the famous frontispiece to William Harvey's *Disputations Touching the Generation of Animals*, fully developed beings appeared as bursting forth from out of a transcendental egg held by God.[48] The motto adorning this frontispiece reads *Ex ovo omnia*, and came to stand for the theory of ovism, the version of preformation that was most solidly established between 1670 and 1705, and which stated that the female egg holds all of the material necessary for the embryo's development. Ovism was hardly threatened by competing theories, as it owed its success primarily to the rampant "metaphysical considerations about order and agency" that defined the field, rather than "the quality of observational evidence" (Wilson 103). As such, the theory was highly dependent on researchers' imaginations, men who were both "philosophically committed to the invisibility of [fertilization]" (104), and determined to demonstrate the divine mysticism underlying fecundity.

Ovism works out of a tradition set forth by Aristotle, who thought that the parts of the embryo, though not actually there, were potentially there, merely awaiting actualization by means of an "active principle," that is, male semen. Aristotle thus establishes a categorical framework of material and form to define generation, wherein females, as passive vessels, contain the necessary material in the form of the egg, and males the formal principle, who may trigger actuality out of potentiality by means of their

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their respective fashions. *Prospective*, here and again in "Essay 3," means "telescope," so Mather makes telescopic sight equivalent with the Word of God, demonstrating how the vocabulary of astronomical and microscopical science could be employed for non-scientific purposes.

[48] An alternative version of preformation includes the theory of "preexistence," a particularly theological doctrine which was thought to have been championed by Saint Augustine, and stated that all existing organisms were simultaneously brought into being at the beginning of the world. This notion would give rise to the doctrine of *emboîtement*, which argued that the parent organism encases the germs of all future generations that might develop from it. See Wilson chapter four.

spiritually charged seminal fluid. Harvey disagreed with Aristotle's formulation, however, arguing that the female must contain a formative power, for, as he observed in the hen, females can make eggs even if they are sterile without the male counterpart, and in the bodies of female humans, the egg is certainly there. Harvey would promote the egg as a symbol of the *vital primordium* that might link oviparous and viviparous reproduction, but ultimately believed that fertility originated neither in females nor males. Any formative power conferred to men and women must be derived from a higher power; God controls fertility in Harvey's system, a characteristic demonstrating ovism's ties to metaphysical considerations of order and agency. For Harvey and other supporters of ovism, the actual process of fertilization cannot be observed, not because our microscopes are too weak, but because the operation *is invisible*; fertility names a power ordained by God, not a bio-mechanical transaction—it is noncorporeal, immaterial, spiritual.

Despite considering his theory to be a decisive break from Aristotle's, Harvey's emphasis of God's role in procreation amounted to a kind of renewal of Aristotle's categories; male semen may not be formative in itself, but serves as a vehicle of God's "divine breath." Ovism's intrinsic sexism is obvious enough: firstly as many women would likely find their comparison with fowls insulting; and secondly because it suggests that men maintain a higher connection with God as the chosen conduits of spirit, while women merely contain the biological material without the power of the soul, including its features of rationality and reflectivity.[49] The metaphysical schemas of being are thus communicated in such early theories of reproduction, and encourage an unjust spiritual

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[49] Wilson relates a poem written by Harvey's friend Dr. Martin Lluelyn that compares women to hens, and captures the central sexism of ovism's motto *Ex ovo omnia*:

> That both the Hen and Housewife are so matcht,
> That her Son Born, is only her Son Hatcht,
> That when her Teeming hopes have prosp'rous bin,
> Yet to Conceive, is but to lay within. (109)

The veneration of the female egg resulted in an unstable valuation of the female sex, for on the one hand it described women in terms of biological, soulless material, as hen-like, while on the other hand it likened the egg to the "vital primordium," what could easily be considered as the most perfect and God-like substance on Earth. Adding to the instability was the idea that all women—including virgins and those who have taken holy orders—had an "indelible sexual destination imprinted on them" (131) from birth. "[T]heologians," Wilson argues, "could not agree whether women were degraded or excessively elevated by [ovism]" (131).

hierarchy wherein men maintain a superior place. Just as the microscope upset ocularcentric categorizations by dismantling the traditional privileging of whole to part, it further challenged preformationism by undermining its dependency on divine intervention. As Wilson aptly states, "the production of new phenomena is a powerful weapon against metaphysics" (103), and with further employment of the microscope in the field of sexual reproduction, the faith in a spiritual mystery underlying generation that defined ovism became increasingly unstable.

The "new phenomena" that put the most pressure on preformationist theories like that of Harvey's was the discovery of spermatozoa in the 1670s, which not only provided a clue as to the biological component provided by males in procreation, but also made it difficult to imagine semen as a sacred "power," containing, as it did, the tireless movements of countless animalcules.[50] In this way, the discovery speaks to a much greater concern that Christian institutions faced in accordance with the emergence of microscopy: that at the bottom of human generation lies something other than spiritual mysticism. As pointed out above, the microscope reveals a naturalistic chaos existing beneath the limits of perception, not an orderly realm of formal essences. Certainly, the chaos of animalcules observed swimming in man's seminal fluid appeared irrational—perhaps even unnatural. For these reasons, the discovery was not met with eagerly, and as such, spermaticism remained a discredited position well into the early eighteenth century. Furthermore, those who did study spermatozoa generally approached the matter with shame; Leeuwenhoek, for example, worried that he would be accused of "sinful contrivance" and adamantly testified that his samples were procured by "hastening from the marriage bed to the microscope" (Wilson 132). When the number of observations increased in the late seventeenth century, few microscopists were willing to publish for fear of immodesty, and when they did, their results were typically published in Latin, "so

[50] Marcello Malpighi, though conflicted about the validity of preformationist theories, observed with his microscope that different parts of a fertilized egg appeared to develop at different times, suggesting that the rudimentary parts do not commence development simultaneously, and likely are not all actually there *de novo*. Despite the pressure that such observations had on the premises of preformationism, the bias towards Harvey's system—with its appeal to a readily given natural world ordered by God and its dependence on metaphysical reasoning—was generally upheld, and the competing theory of spermaticism remained a "minority position well into the first quarter of the eighteenth century" (Wilson 131).

as not to offend ladies" (Wilson 133). The controversy regarding procreation engineered by the microscope follows the instrument in its transatlantic movement, both in the threat it presents to preexisting religious hierarchies—thus motivating men like Winthrop and Mather to protect their authority over science—and in its unchaste manner of questioning preformationism by appealing to things thought contrary to modesty.

Mather's Christian concerns with microscopy, loudly announced in *The Christian Philosopher*, appear less explicit in his 1685 elegy written for Nathanael Collins. Included in this elegy is the following stanza and footnote:

> I would that you, my Friend, each *drop* of Ink
> Could fill with *Elogyes* no fewer then
> The little *eels** that may swim in't: I think
> They all should celebrate this *Flow'r of men*.
>
> ________________________________
>
> **of which I can with my* Microscope *see incredible hundreds playing about in one drop of water*. (qtd in Lewis 254)

According to Lewis, "the microscopist is not familiar with myriads of eels in a drop of *water*" (254), and Mather, considering his knowledge of the field, would have been familiar with the "incredible hundreds" of spermatozoa contained in a drop of semen. Mather's preference to refer to semen as water "tallies," writes Lewis, "with the Puritan's recognition that the sexual stimulus is sufficient without aphrodisiacs; its super abundant appeal should be quieted through modesty in dress, decency in books and drama, and much else derided as puritanical" (255). This is not the only example where Mather censors his discussion of semen in order to maintain Puritan propriety. In *The Christian Philosopher*, when explaining the wonders of animalcules, Mather writes,

> All this Curiosity many times lying in a Body much smaller than the smallest *Grain* of Sand. A *Drop of Water* is a sort of an *Ocean* to them! Mr. *Derham* in a *Drop* of the *green Scum* upon Water, a *Drop* no bigger than a *Pin's-head*, sees no fewer than an hundred frisking about. How vastly many more in a *Drop* of *Pepper-water*! How vastly many, many, many more, in a Drop of the *Leuenhoeckian* Examination! (160)

The circumlocution Mather employs here and elsewhere—preferring "Leuenhoeckian Examination" to "male semen"—is likely motivated by the Puritan desire to amputate from all praises to God anything that is improper, and anything directly associated with sex, considered as naturally sinful and base, was therefore avoided. The preservation of modesty regarding microscopical observations of semen was not only a matter of Puritan shame, but a matter of the anxiety consequent from encroaching too closely on the mystery of God. It is no great surprise then, that Mather, perhaps the earliest American proponent of microscopy, would attach an explicitly Christian agenda to the use of the instrument, and that this agenda would manifest in the language he employs when trying to suppress the improper insights it affords.

But such observations of semen raised additional concerns that demanded theological answers, especially when considering the clear imbalance of production between the egg and the "incredible hundreds" of spermatozoa displayed beneath the lens. One would expect that if God had calculated and determined fertility, then the millions of seminal animalcules cast off, each representing a potential life, would not only be unnecessary, but tragic. Leibniz had worked through this seemingly cruel doctrine by reasoning that, while each spermatozoon was ensouled, God ultimately chooses one to fertilize the egg, adding a degree of rationality and perfection to the preexisting sensitive soul, and thereby elevating it to a higher human status.[51] The argument reproduces the "great chain of being" in that it understands the soul in terms of a spiritually organized hierarchy, where different forms of life are distinguished by varying levels of spiritual privilege. Just as the discovery of animalcules challenged the chain by questioning their place during the flood, the observation of spermatozoa further upset Christian ontology by undermining the preformationist model of procreation.

And so even after the discovery of spermatozoa, microscopists spanning the Atlantic were unwilling to accept that the "little eels" played a significant role in human procreation. As an alternative to theories of generation triggered by microscopical observation, preformationism served as a means to evade the immodest nature of the problem—a kind of scientific retelling of the stork myth—but more importantly, as Jacques Roger suggests, preformationist interpretations of eggs and seminal animalcules amounted to an "assertion of being as opposed to becoming" (Wilson139). The doctrine

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[51] See Wilson 136.

supposes and encourages an understanding of the world divorced from change—as fixed, ordered, and essential—as "pre-existent." In metaphysical terms, the dilemma of generation produced by the microscope corresponds to Jay's account of ocularcentric ideology, that also "tends to elevate static Being over dynamic Becoming, fixed essences over ephemeral appearances" (24); the microscope disrupts the notion of an unchanging and eternal presence produced by the privileging of sight, and as such, works its way into unsettling doctrinal models of being that are dependent on essentialist thinking. In this way, the microscope embodies the idea of *disruption*, of undermining faith in metaphysical and spiritualistic categories of being, in a transcendent and divine order determining the world's events, and in essence given *a priori*. Disruption and particularity are preserved in the microscope, as ideas compounding its epistemological formulations, carried with it through its transatlantic movement, and intensified as the instrument flourishes in the nineteenth century.

The Microscope, after Mather

In this study, I aim to demonstrate how a new microscopy unfolded alongside Emerson's, Peirce's, Melville's, and Dickinson's careers. To highlight the microscope's role in shaping the period, I have interwoven its historical developments and rise to prominence with critical analyses of these authors' works, and thus significant aspects of its history, such as the advancements of reflecting microscopes, theories of aplanatic focal points, and achromatic lens systems, along with considerations of a market for non-specialized publications in the field that emerged in the mid-nineteenth century, will be clarified in the chapters that follow. However, a few preliminary remarks leading to my period of focus may be helpful for understanding this new microscopy and its importance for these American authors.

In 1732, roughly five years after Cotton Mather's death, Thomas Hollis of London sent to Harvard a gift of a "double microscope and its utensils" (Woodruff 241). It was the first microscope owned by the college. The instrument was a Wilson "screw-barrel" microscope, one of the most successful types as regards to convenience and performance. These microscopes were, according to Clay and Court, "probably made in larger numbers than any other microscope" (44) available during the eighteenth century.[52] Though this microscope was popular in Europe, it was less so at Harvard, as few students are known to have made any use of the instrument. It was eventually destroyed by fire in 1764. Governor Yale in New Haven proposed sending to his College "some mathematical instruments, and glasses for making philosophical experiments, as microscopes, telescopes, and other glasses" (Woodruff 241) in 1719, but the motion was unsuccessful. Not until May 19, 1734 did Yale obtain a microscope for its "Philosophical Apparatus" collection, which had served the college as an available "machine for a course in experimental philosophy" (242) throughout the eighteenth century. This instrument is considered to be the first microscope actively acquired by a New England college.[53]

Lewis claims that the acquisition of microscopes by Harvard and Yale signify that the instrument had "at last become common in America" (259). However, though the

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[52]James Wilson, an optical instrument maker working out of Hatton Garden, London at the turn of the seventeenth century, had first described his "screw-barrel" microscope to the Royal Society in 1702. Wilson did not invent this type of microscope, but because he had improved its optical performance so much, its rise to popularity and commercial success is credited to him. The screw-barrel microscope, in its compound form, was invented around 1685 by Tortona, an Italian instrument maker. In 1689, Joseph Campani and Marcus Antonius Celi exhibited similar microscopes to the Academia Physico-Mathematica, held at Lord Campani's house in Rome. The design was eventually applied to the single microscope by Nicholas Hartsoeker.

The basic form of Wilson's screw-barrel microscope, which he first described to the Royal Society in 1702, consisted of a small cylinder with wide external threads at both ends that can be screwed into or out of a main microscope barrel. Focusing was done by twisting the barrel and moving the specimen closer or further from the magnifying lens. Sometimes the maker would include a handle made of brass or ivory to turn the screw barrel. It was initially intended as a hand instrument; a user would hold the instrument to her eye and angle it towards the sky in order for light to pass through the transparent object. Later, it would be mounted on a stand with a mirror attached, and sometimes used as the projector in solar microscopes (Clay and Court 41-4). Smaller versions of Wilson's microscope, called "pocket microscopes," appeared during this time and became popular especially amongst botanists who were eager for a convenient instrument that could easily travel into the field.

[53] Other variations of the screw-barrel microscope were produced and popularized after Wilson, mostly by English, German, and Dutch manufacturers. One maker of the screw-barrel type that received popular notice was Edmund Culpeper. That his instruments became popular at first seems puzzling, as Clay and Court assert, "[t]he Culpeper microscope, even when new, could never have been very satisfactory, for every change in humidity would affect the fit of the one tube in the other, making it too tight on one day and too slack on another" (127). Culpeper's method of focusing differed from the fine-adjustment screw pioneered by Helevius that many other makers adapted. His instrument focused by sliding one cardboard tube into another. This less effective focusing system, along with an oftentimes troubling tripod base, made the Culpeper difficult to use.

microscopes held at these institutions were some of the first to appear in the United States, they were obviously not manufactured by American makers. “Not only did no American microscope maker appear on the scene until the middle of the nineteenth century,” insists Donald Padgitt, “but microscopes were not even customarily carried in stock by scientific instrument dealers in America before at least 1838” (4). Simon Gage, former president of the American Microscopical Society, describes the likely reason for the lack of instrument makers as follows:

> It is understandable that America should have been late in entering so recondite a field as microscopy. The early settlers had quite enough to do to raise food for their families and livestock … So, for 200 years Americans depended on Europe for spectacles, spyglasses, surveying instruments, and for an occasional microscope. (9)

Eighteenth century Americans held little concern for the natural sciences in Gage’s account, and microscopy was especially ignored, considered as it was an “idle” pursuit, a “diversion, entertainment or, at best, a hobby by many of its activists” (Padgitt 3). The real demand for scientific instruments arose not from philosophical inquiry, but from the necessity of land delineation and navigation, forming an early market for more practical equipment used for surveying. Not until the mid-nineteenth century, roughly two hundred fifty years after its origin, did a substantial industry for the making of microscopes appear in America.

For these reasons, American microscopy followed suit with most American sciences that tended to lag behind advancements made in Europe. In fact, as Cassedy argues, “American adoption of the achromatic microscope, like the emergence of chemical laboratories, trailed European developments by more than a decade” (77). Cassedy continues, “[w]ith respect to microscopy, the delay was no more than was to be expected, given the primitive state of American optical technology and the negligible optical industry, together with the small size, relative feebleness, meager facilities, and paucity of funds of virtually all American scientific and educational institutions prior to 1830” (77). In addition to the lack of funding and necessity, American scientists, who were usually trained by European teachers, were reluctant to encourage use of the instrument until the academic example was set by their superiors across the Atlantic.

Cassedy notes that American medical students in particular resisted the microscope, as they found "that most of their texts treated the microscope and its findings 'with distrust and even with contempt,' if indeed they mentioned them at all" (79). Anti-microscopism was especially strong among the Paris clinicians, who "recognized the new instrument as a threat to their *a priori* systems" (80) of medical theory.[54]

According to Padgitt, the earliest development of an autonomously crafted American microscope prior to 1840 is lost to history, owing to the fact that American instrument makers, unlike their European counterparts, "were not regulated or subsidized by institutions that might have maintained records or left other published histories of clues covering the makers and their trade" (1). While European universities, guilds, and other governmental fixtures helped shape the emergence of the microscope while leaving documentation of the industry, American manufacture of scientific instruments rested on the shoulders of independent individuals who "labored under relative obscurity" (1).[55] Though a few attempts to copy European advancements with achromatic lenses were made in the 1820s, it was not until the late 1840s with the work of Charles A. Spencer that American opticians found any success with fashioning achromatic lenses.[56]

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[54] Peirce will eventually describe Louis Pasteur's use of the microscope as a significant moment in the history of science, countering anti-microscopism as representing the dangerous overdependence on metaphysical models of scientific investigation.

[55] Padgitt has identified at least sixty-five individual instrument makers working in America by 1800, most of whom were silversmiths, goldsmiths, watch makers or bell founders. Those who made or dealt scientific instruments often advertised themselves as "mathematical, optical and philosophical instrument makers," a category that would eventually include the microscope, but it has yet to be proven that any of these early American makers actually made microscopes.

[56] In *Microscopy in America (1830-1945)*, Simon Gage writes "The first steps of creative microscopy in America were taken by two young friends, one of Boston, Massachusetts, Alden Allen, and one of New York State, Edward Thomas" (9). Only Thomas, who was an engineer on the Cayuga-Seneca and Eerie Canals, published his efforts toward crafting an American microscope, and though he speaks very highly of his friend's accomplishments in the field of optics, no record of Allen's work has survived. Both men were likely inspired by the achromatic lens that was developed during this period, and attempted to fashion their own lenses sometime during the 1820s, but were unsuccessful. Padgitt goes so far to say that "[Thomas's and Allen's] contributions to the development of the microscope must be considered minimal; at the most, it appears that they were fairly accomplished amateur opticians whose original findings, if any, were not relied upon or utilized by subsequent American microscope makers and opticians" (5).

Charles A. Spencer, America's first microscope maker, was born into a well-known and respected family from Lennox, New York in 1813. After studying classical Latin and Greek at Cazenovia Academy, then Hobart College, Geneva College, and eventually at Hamilton, Spencer left his formal education to experiment with lens craft at home in Canastota. His experiments led to some of the best microscopes the world had ever seen. Spencer became familiar with the latest achromatic microscopes as improved in Paris

Overview of Chapters

Wylie Sypher claims that "[t]he nineteenth century was among the most visual periods of Western culture, the most given to ideals of precise observation" (qtd in Jay 113). A great number of innovations emerged throughout the nineteenth century that might support Sypher's claim. Department stores, with their "massive sheet glass windows displaying a wealth of commodities to be coveted" (Jay 120) began to line city sidewalks in the 1860s, enticing would be customers to stop and look, engulfing them in what Jay calls a "cult of images." Along with the visual cacophony of commodities facing the nineteenth century consumer, ocular desire was further increased by the explosion of advertising, first made prevalent by the lithograph in the closing years of the eighteenth century, and then enhanced still by means of the daguerreotype in 1839. Artificial illumination effectively eliminated nighttime's natural challenge to visual reception by lighting cities first with gas lamps in 1805, then with brighter kerosene lamps in 1869, and ultimately with Edison's electrical lighting in the 1890s (Jay 123).

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and London, and began making his own throughout the 1840s. His version of Dr. C.R. Gilman's "Chevalier Universal" microscope was highly acclaimed for its remarkable clarity. In 1848, after "rigorously testing" Spencer's microscope, Dr. Jacob W. Bailey, Professor of Chemistry and Mineralogy at the United States Military Academy at West Point, submitted the following endorsement to the *American Journal of Science,* known at the time as *Silliman's Journal*:

> Having carefully examined an achromatic microscope made for Dr. Gilman by Charles A. Spencer, Esq., of Canastota, N.Y., I can with confidence as well as pleasure, give my testimonial to its great excellence. I have had it side by side with my own large microscope, (one of Charles Chevalier's largest achromatics, price 1000 francs), and can speak unhesitatingly of their relative merits. I have used Chevalier's instrument with great satisfaction for several years, and have found it in almost every respect convenient and satisfactory. In regard however to the lenses of higher power, it is a fact easily established by comparative trial, that Spencer's lenses are far superior to any of Chevalier's which I have yet seen. Its superiority consists in a great angle of aperture and much better definition. With Spencer's glasses I was able, without difficulty, to see the cross lines on the Navicula hippocampus, (the most difficult test object now known to me, and which was sent to me from England, as the *test object par excellence*), while with Chevalier's, by the same light, I could see them only with great difficulty. (qtd in Gilman 238)

This is just one of the many public announcements affirming the quality of Spencer's instruments. By the time this letter was written, Charles Spencer had established himself as the premier maker of microscopes, telescopes, and various other opticals in America. Bailey had closed this letter by writing, "I look upon the results obtained by Mr. Spencer as a proud triumph for American art," a sentiment shared by the American scientific community at large. Historians further locate Spencer's claim to the venerated position of America's first microscope maker in a catalogue he issued nearly ten years prior to the publication of the above letter. This catalogue follows suit with other price-lists and modes of advertising that had categorized the microscope as a "philosophical instrument." This is to say that the packaging of scientific devices like the microscope as "philosophical instruments" has, relatively speaking, only recently fallen out of vogue.

Finally, the invention of the camera, what Jay calls "the most extraordinary technical innovation in vision during the nineteenth century, indeed perhaps in all human history" (124), produced with it a "frozen, disincarnated gaze on a scene completely external to itself" (128). Its manufacture of direct and everlasting images made reality somehow "more real," by which I mean more easily discernible in terms of observational precision and conformable to the ideals of an extraordinarily visual culture. Doubtlessly, such means of visualizing the world influenced scientific practices. Ian Hacking would agree with Sypher's claim, and could easily draw a connection between the "ideals of precise observation" that defined the visuality of the nineteenth century with the ideals of precise measurement that defined the period's scientific observation; "only around 1840," Hacking argues, "did the practice of measurement become fully established. In due course, measuring became the only experimental thing to do" (5).

The advancements made to microscopes in this period surely inform the visual culture of the nineteenth century, most remarkably with the innovation of the achromatic lens. Due to limits of optical design, along with the unexpected challenges resulting from observations of the microworld, microscopy significantly waned after reaching its peak in the 1680s, and remained dormant for nearly one hundred years. But soon after the appearance of the achromatic lens in the 1830s, a resurgence of the science materialized. The problems solved, or at least significantly diminished, by the achromatic lens were the seemingly insurmountable hurdles of spherical and chromatic aberration. In short, early compound lens systems were unable to bring into focus the differing wave lengths of light passing through the glass, and thus the image produced was not singly focused, but consisted instead of multiple-superimposed images of varying colors. While the viewer could clearly see those parts of the sample closest to the center, the edges of the object remained distorted. Such aberrations were usually thought of as natural barriers that consequently determined the limits of magnification, and thus provided classical microscopists like Hooke, who thought that all of the important microscopical discoveries had already been made, with a rationale that the science could progress no further. After several advancements in optical theory, instrument makers throughout Europe began combining layers of glass with different rates of refraction to effectively eliminate chromatic aberration. The result was the achromatic lens.

"Overnight," writes Lynn Gamwell, "a crystal-clear window opened into the microscopic realm" (49). With the aid of achromatic optics, nineteenth century microscopists could now view microorganisms in brilliant natural color and remarkably precise detail. Gamwell continues,

> Images of microorganisms made with an achromatic microscope became for the mid- to late- nineteenth-century public what celestial images recorded by the Hubble Space Telescope are today: They offered an extraordinary sense of being transported to another scale—an exotic place tinged with danger, they were exquisitely beautiful, and they were reproduced everywhere. Images in the popular press of microbes in a drop of public drinking water reminded people to boil water; pictures of germs floating in the air encouraged urban dwellers to get fresh air. (49-50)

Gamwell's account displays the powerful effects that the achromatic microscope had on nineteenth century visual culture, firstly by highlighting the novelty of the subvisible world—the "extraordinary sense of being transported … [to] an exotic place tinged with danger" echoing Peirce's observation that the microscope had "transported our race to another planet" (5.513)—and secondly by suggesting the co-operative nature of technological mediation—that the instruments through which we experience the world play an active role in producing that world, often triggering social adaptations (boiling water to remove microbes and avoiding airborne germs). Her account further demonstrates the microscope's rise in popularity, as the publication of microscopical images by the popular press implies a public increasingly aware of the microworld. It is this world, augmented by the newly re-exposed *terra subvisibilia*, in which Emerson's works take shape.

Contrary to standard opinions, which often characterize Emerson as a "fuzzy-minded idealist" prone to falling into ditches for the sake of staring at stars, the "sage of Concord" was undoubtedly well informed about and well engaged with what we might today call "hard science." Recent scholarship has worked to dismantle the stereotypical Emerson—the type who unabashedly privileges metaphysics over science and substitutes poetic license for sober philosophical analysis—by looking at his interest in disciplines like astronomy, biology, botany, and physics, his readings of Nicolaus Copernicus, Galileo Galilei, Johannes Kepler, Pierre-Simon Laplace, and Isaac Newton, his visits to scientific institutions like the Cambridge Observatory and the *Cabinet d'Histoire du Jardin des Plantes*, and his associations with scientists such as Benjamin Peirce and Antoine Laurent de Jussieu. Emerson tended to view the hard sciences as part of a comprehensive and common intellectual culture that included metaphysics, ethics, and aesthetics, and, as such, he frequently crossed what were to him porous disciplinary boundaries. One could argue that his willingness to blur the lines of demarcation later drawn between philosophy and science, even if not explicitly intentional, anticipates current theoretical trends devoted to pluralism, diversity, and interdisciplinarity.

However, despite Emerson's fluency in both metaphysical philosophy and natural science, there is an impulse underlying the latter that Emerson was reluctant to accept. The enmeshing of science and philosophy in a shared intellectual culture entails not merely adopting a skeptical attitude, of which Emerson approved, but also engaging in certain scientific practices, like experimentation, measurement, and instrument-aided observation. Of these many practices, two stand out as particularly troubling for Emerson: the use of the microscope and its associated ideology of dissection.

Emerson cultivated a knowledge of microscopy hardly examined by scholars: he met with famed maker of reflecting microscopes Giovanni Amici during his first tour of Europe in 1833, as documented in *English Traits*; he read works on entomology by figures like William Kirby, William Spence, and John Abernathy, and works on optics by Sir David Brewster; he kept a microscope in his study along with other trinkets and instruments; and he wrote about numerous forms of animalcules, their shapes, sizes, and behaviors. Knowledge of the microscope seeps into his writings on a wide variety of subjects, from reflections on the history of philosophy, to his reviews of representative men (he likens Goethe's eyes to microscopes), to his elevating of the poet as translator of nature (by reading the fossils of animalcule shells), to thoughts on language, naming, and grammar.

My analysis of Emerson's relationship with microscopy begins with a connection I find between entomology and etymology. I trace "entomology" to Aristotle's use of *ἔντομον*, or *entomon*, meaning “insect,” which is worked from the Greek adjective *ἔντομος*, to “cut up,” and thus renders entomology as “the science of incision, of cutting.” Entomology therefore refers not merely to the science of insects, but to the process of dissection, or the taking a particular from out of the whole. Microscopists, by focusing on little pieces of animals like flakes of skin, hair, and bone, perform the kinds of actions signified by entomology; and the microscope, predicated as it is on the conception of a dissectible and detachable world, preserves the entomological process, regardless of the nature of the sample. I further argue that the very process of etymology, the focusing on and detaching of root pieces from compound words, requires dissection. These two disciplines—entomology and etymology—share a common process that Emerson finds not only ethically disputable, but logically contradictory. His metaphysics leads him to deduce the nature of particulars from the all pervasive spirit that unites them, and so picking objects to pieces would be counterproductive. Thus the microscope, by engineering a mode of viewing that necessarily entails dissection—pulling particulars out from their organization in the whole and viewing them independently of a larger context—becomes for Emerson a manifestation of a specifically anti-transcendentalist manner of engagement with nature, as it endorses a contrary position of particularity and separation. The microscope isolates particulars; it does not integrate them. Ultimately, the analysis of the microscope and its philosophical-ideological associations leads to a confrontation with Emerson’s correspondence theory of language. His theory of symbolism, far too dependent on metaphysical regularity and design, cannot account for the mode of viewing engineered by the microscope and the irregularity of the microworld it displays.

Whereas Emerson witnessed the resurgence of microscopy and the spread of the achromatic lens, Charles Sanders Peirce was born into a world already shaped by it. Inspired by the newfound clarity of microscopical vision, mid-nineteenth century naturalists throughout Europe and the United States soon formed specialized societies devoted to microscopical research. Drawing interest from experts across the spectrum of sciences, these groups held conferences and viewing parties that consequently produced a community for the exchange and appreciation of microscopical theory. They funded journals to both publicize observations of the microworld and to advertize the latest developments of microscope design. Interest in the microscope steadily increased throughout the 1840s and 1850s to become a fixture of nearly every scientific discipline. The instrument outgrows its specialized status during this period, as advertising campaigns, public exhibitions, and introductions to the science geared towards the amateur microscopist eventually reached a wider audience. Countless books, with titles like *The Microscope and How to Use it: A Handbook for Beginners*, and *A Popular Handbook to the Microscope* appear at the time, indicating the instrument's rise in popularity.

When surveying the many works on the microscope that were produced in the mid-nineteenth century, another aspect conditioning its popularization emerges, namely, the role of Christian institutions guiding its entrance to the market. The microscopical challenge to religious hierarchies that had followed the instrument in its transatlantic movement via John Winthrop, Jr. and Cotton Mather is found preserved in early introductory books on microscopy. Sir Richard Phillips's work *The Wonders of the Microscope; or, An Explanation of the Wisdom of the Creator, in Objects Comparatively Minute; Adapted to the Understanding of Young Persons* serves as an early example of the religious fingerprints covering microscopical knowledge. "Adapted to the Understandings of Young Persons" implies Phillips's motivation to describe microscopy to a juvenile audience with a non-specialized vocabulary, and "Explanation of the Wisdom of the Creator" makes explicit the religious program he will advocate. Though a good amount of the text provides non-spiritual, detailed, and elementary illustrations of microscopical observations, Phillips regularly interjects Christian commentary, as in the following passage:

> Microscopes have brought us acquainted with a new world of vegetables and animals, and have demonstrated to the careful observer, that there is no less of order and harmony in the construction of the mite, than in that of the whale or the elephant. The only difference is, that the weakness of our sight prevents us from penetrating into the nature and organization of small bodies, which often escape our eyes, and which can only be perceived by the assistance of glasses. These teach us, that the smallest objects, of which our forefathers had not the least knowledge, have extension, parts, and a well organized form. The mention of

> some examples will lead us to acknowledge the power, wisdom, and goodness of that God upon whom we all depend for existence and happiness. (10)[57]

Phillips clearly sees in the microscope an opportunity for further confirmation of the Christian universe, as well as a kind of weapon protecting Christian values from the potential threat of secular modern science. As with Winthrop and Mather, for Phillips the new points of view made available by the microscope do not lead to questioning the spiritual hierarchy, but to greater appreciation of God's spectacular power and wisdom.

Thomas Dick's 1851 historical survey, titled *The Telescope and Microscope*, similarly demonstrates the stakes that religious authorities must have associated with the popularization of microscopy, as he also makes a case for the necessary acknowledgment of God's authority over microscopical discoveries. In his introduction to the section of text dedicated to microscopy, Dick provides the following transition:

> We naturally associate ideas of magnitude with power; but to discover the infinite in the invisible, not because it is remote, but because it is too diminutive to be discerned, baffles all our attempts to 'find out' Him whose greatness is as unsearchable in the minute as the mighty. (96)

Confident that the mystery of the invisible world will never be fully disclosed, Dick takes the sublime microcosmos as evidence of a divine creator, whose greatness is too great for human understanding. He further displays, if only implicitly, a serious concern for the Christian scientist: that instruments like the microscope may encourage naturalists to shirk the tenants of Christianity—to "find Him out"—even if such attempts are futile.

Dick's religious devotion does not interrupt his history of the telescope and microscope to any large degree. He does include a few qualifying statements sustaining this motive, such as "God has been pleased, in various ages, to guide men to those discoveries, which have enlarged their view of his perfections" (9), and "Every part of creation demands our attention, and proclaims the power and wisdom of the creator"

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[57] Along with such comments, Phillips frequently quotes from poets like James Thomson and Richard Savage, typically choosing lines that share both his enthusiasm for microscopy and his Christian devotion. One of his favorites is William Cowper, whose poem "Tirocinium; or, A Review of Schools," includes the lines:

> Such microscopick proof of skill and pow'r,
> As, hid from ages past, God now displays,
> To combat atheists with in modern days. (637-9)

(126), but the work itself does appear to be a legitimately researched account of events associated with microscopical history. That is, until the book's conclusion. What was at first a text on the history of microscopy becomes an all-out fire and brimstone style attack that demands scientists to better highlight God's influence on the microworld:

> It almost seems trite and needless to say, that the [microscopical] discoveries which we have been considering … demonstrate the existence of God, and teach us lessons of confidence in him, by showing us that there is nothing too minute for his notice, or too humble for his care. Why is it, then, we may inquire, that any should habitually live as if He could nowhere be seen in 'the things that are made?' Why is it that He should be so little thought of, acknowledged, and adored, when his glory is reflected by every object in nature? … MAN HAS SINNED, and he 'will not seek after God,' till he knows more than nature, with all its light, can teach him. He is surrounded, as we have seen in the preceding pages, by proofs of wisdom and power, infinitely surpassing the highest efforts of human intelligence and skill. This may be confessed. (190-2—Dick's emphasis)

This example is only a brief selection of the many pages concluding Dick's work, which contain numerous bible verses, quotes from religious figures, and accusatory questions, like "Has the reader … been thus reconciled?" (192). For Dick, scientific instruments like the telescope and microscope emphasize rather than minimize God's role in the universe, as well as man's obligation to revere him. But more importantly, they provide evidence for God's very existence, which Dick must feel is under attack by those who so little think of Him. Dick's history of the microscope is not merely a history, nor simply a devotional, but an argument for the existence of God.[58] While the specific premises of his argument are not terribly interesting, what is interesting is that the argument appears at all, here and in other microscope books produced at this time. So many of the works associated with microscopy contain similar appeals to God's divine construction of the microworld that it is difficult to find an explicitly secular account of it.

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[58] His concluding effort is clearly derived from the "watchmaker analogy" used to support teleological arguments for God's existence, an analogy that was established well before the nineteenth century, but was made famous by William Paley in 1802. "Supposing that we had never seen a watch before," writes Brendan Sweetman, "Paley argues that we would conclude, after examining it carefully, that it was designed by a mind. It is too intricate an object to have come about by chance, which is the only other alternative, and it clearly seems to have been put together for a purpose" (31). The microscope thus represents man's attempt to examine the natural world carefully, leading him to the only possible conclusion: that God had designed it.

In addition to the authorial interjections of Christian arguments, written in such heavy handed prose, that one encounters in these early works on microscopy, the presses that made these works available to the public underscore the religious influence on their popular distribution. Dick's work, for example, was first published by The Religious Tract Society in 1851, and then revised and republished in New York by Lane & Scott for The Sunday-School Union of the Methodist Episcopal Church a year later. The Religious Tract Society published other microscope books as well, such as Lewis Wright's *A Popular Handbook to the Microscope* and Charles Williams's *Curiosities of Animal life; with the Recent Discoveries of the Microscope*. The Society for Promoting Christian Knowledge published Phillip Henry Gosse's *Evenings at the Microscope; or, Researches among the Minuter Organs and Forms of Animal Life* in 1859, and M.C. Cook's microscopical analysis titled *Ponds and Ditches* in 1880.

The religious prose so often used in nineteenth century microscope books clearly conveys Christian motivations, and the presses publishing these books evince the influence of Christian thought on the microscope's popular acceptance. When looking at the transatlantic assumption of European microscopy by early American naturalists—namely Winthrop and Mather—the observation that Christian institutions conditioned the instrument's popular emergence becomes easier to understand. Underlying Dick's argument regarding the connection between the subvisible world and God is a drive for complete knowledge of the universe that was revitalized through earlier alchemical pursuits. The microscope comes to represent something more significant than an idle hobby for the dilettante. It provokes serious attacks and defenses on the part of those charged with metaphysical knowledge and totalizing systems, where looking "too closely" at things becomes a threat.

Whether or not the religious ideals inextricably linked to the microscope directly provoked Peirce's strong anti-metaphysical stance—his wish to detach such metaphysical fancies from scientific observation—is difficult to tell, though I think the case can be made. What is certain is that by the time Peirce enters the scholarly scene, the microscope was common, and thus his world was one familiar with a mode of vision that emphasized particularity against earlier transcendentalist conceptions of the whole. What is equally certain is that modes of observation were crucial to Peirce; observation provided him with a kind of origin story detailing the rise of the various sciences. It becomes the chief qualifier determining the borderlines between the differing branches of science and consequently serves as his primary means for organizing them into a remarkably detailed, Aristotelian-inspired, and seemingly comprehensive blueprint. In this way, Peirce's grand project of re-categorizing the sciences hinges on the microscope, as not only a representation of instrumentalized observation, but as the means to understand the significance of observation itself.

Throughout his long career, Peirce never lost his strong realist convictions as he regularly defends the mind's instinctual agreement with reality: in the early 1880s he writes "[i]t cannot any longer be denied that the human intellect is peculiarly adapted to the comprehension of the laws and facts of nature" (2.750); in the late 1890s he says "the mind of man is adapted to the reality of being" (4.157), where this "instinctive adaptation to the Outer World" (4.157), the "sufficient affinity between the reasoner's mind and natures" renders "guessing not altogether hopeless" (1.121); and just a few years before his death he argues that "every single truth of science is due to the affinity of the human soul to the soul of the universe" (5.47), that "every scientific explanation of a natural phenomenon is a hypothesis that there is something in nature to which the human reason is analogous; and that it really is so all the successes of science … are witness" (1.316). But the mind "peculiarly adapted" and sufficiently analogous to reality is one characterized by particularity, not transcendentalist totality; the world is given in pieces, and the mind, functioning in a way that resembles nature, further divides ideas through what he calls "logical distillation." That is, the mind dissects before it synthesizes. Peirce finds in the microscope a means of defining and illustrating this conception of the mind's relation to nature. As such, the microscope becomes a stand-in for the mind, as the mode of viewing that best agrees with a fragmented reality motivated by chance and mediated by signs. Perceiving the world "microscopically" leads Peirce to uncover philosophy's traditional suppression of dissection, and to claim that saving the discipline from its crude metaphysics involves a necessary return to the dissection-room. He will become adamantly anti-metaphysical, and this position again hinges on his use of microscopes.

Where Emerson sees danger in the microscope's isolation of particulars, Peirce sees redemption. Reference to the instrument can be found in nearly every philosophical and scientific topic Peirce addressed—and there are many. Knowledge of microscopy weighs in on his evolutionary cosmology, his *tychism*, and his history of philosophy. Medical discourses generated by the microscope, notably those concerning germs, viruses, and antiseptics, trigger some of Peirce's most acute philosophical speculations, notably his criticisms of both Hegelian contradiction and Kantian categorization. It will define his logic, epistemology, and semiotic, all of which provide a potential correction of the early modern failure to reconcile primary and secondary qualities, or the unmediated view of an object with the microcosmos that it supports. This last connection, drawn between the microscope and Peirce's theory of signs, is particularly important as it displays a shift from Emersonian symbolism to Peircean metonymy—the former resistant to the microworld, the latter indebted to it.

Excavating the ideas in the microscope through my readings of Emerson and Peirce—ideas of isolation, particularity, figuration, and disruption—leads me to consider their literary expressions. By revealing semblant objects as microworlds, the microscope displayed a void between interpretation and perception; "looking microscopically" comes to name a process of detangling figuration. Taking the study of the microscope a step further, I add to my analysis of expository writings a reading of Melville's fiction. In many ways, Melville's turn to the small parallels Peirce's attack on Emerson's telescopic/transcendentalist mode of viewing, as he questions the placidity of the whole by emphasizing the status of the particulars composing it. But unlike Peirce, Melville, as both an artist and the most scrupulous of anti-metaphysicians, fully realizes the potential of microscopical ideas by using them to dismantle all *a priori* categories, including the philosophical, the linguistic, and the political. Melville's "Benito Cereno" highlights the microscopical conceptions of reality, visuality, mediation, symbolism, figuration, and, most importantly, the literal.

"Benito Cereno" is a story about looking, and about looking closely. The opening sequence, given to us through the Yankee Captain Amasa Delano's spyglass, enacts a kind of microscopical magnification as it undoes a seemingly placid surface to reveal one composed of chaos, breakages, neglect, and disrepair; as Delano comes closer to the San Dominick, its status changes, it looks different. The question of reality is as important for this novel as it is for those who use microscopes, in that the closer one comes to an object, the less semblant, or the more chaotic, that object appears. This story about looking becomes a story of misdirection, about what it takes to discern something correctly, clearly, and distinctly. Thinking of the microscope as a mediating instrument allows us to better understand Melville's notion that vision itself is always already mediated, biased, and, typically, unjust. The narrow vision that he gives us, passing through Delano's isolated, particular, and naive mental lens, questions vision as a power that necessarily passes through ideological and figurative structures of meaning before reaching its object. The condition of figuration becomes increasingly important when one attempts to reconcile Melville's inclusion of the story's "deposition." The deposition—a purportedly "truer" account—attempts to retell the narrative in a way that resists value judgments and judgments of perception. The document represents a stable verification of reality, and thus serves as a foil to the story preceding it. But its dependence on the same methods of figuration composing the narrative demonstrates its impossibility as such. The document, as an unmediated viewing of an object, becomes unrealistic and untenable, as there is no pure, unmediated mode of vision, just as there is no such thing as disinterested truth.

This microscopical reading of Melville involves working out a theory of symbolism operating in *White-Jacket*, *Moby-Dick*, and "Benito Cereno," one that questions the relationships between figurative language, structures of power, and the status of the literal. Melville's theory of symbolism, I argue, is one that attributes the status of the symbol to structures of power that charge it with meaning. Those with authority, those with direct access to the rules of language and symbolic exchange, those who, in short, write the laws, reproduce the structures of power, and, consequently, the prejudices those structures assume. In this way, Melville applies microscopical insights to ethical issues by including a political register to his theory of language, one that Peirce failed to conceive of and thus counteracts his otherwise adamant anti-metaphysical stance. First, in *White-Jacket,* Melville confronts the unjust bigotry nascent to arbitrary codes of meaning through a sustained appeal to reason. Learning that rational argumentation is no guarantee of positive political change, Melville then takes the theory a step further in *Moby-Dick*. Here, he discloses how figurative language functions under the same rubric of reproducing authoritarian structures by demonstrating how multiple interpretations of the symbolic presuppose a stabilized conception of the literal, though that conception is always already figurative.

The theory of symbolism that I draw from Melville's works displays his keen awareness of his craft, how seamlessly he slips into moments of meta-fiction, how easily he moves among observations that document social structures, to articulations of ambiguity, to challenges of conventions (formal and cultural), to fiery demands provoking subversive thinking. All of the above are notions regularly associated with Melville, and regularly connected with his distinctive employment of figurative language. However, seeing as Melville was remarkably concerned with figuration, I take this reading another step further to point out that, in addition to his unique acknowledgment of symbolism, he understood the literal in a manner all his own. "Benito Cereno" marks a turning point in Melville's evolving theory of symbolism as he re-appropriates the literal from the confines of figurative power structures to present it as a positive void of meaning. The literal—previously understood as a stabilized ground of meaning, of a one-to-one correspondence between signifier and signified—takes the shape of muteness, of the speechlessness that underlies all speech. The literal, defined as muteness, is comparable to the empty space that exists between levels of magnification that the microscope, perhaps unconsciously, also magnifies when focused on an object. The deposition effectively doubles the telling of the story as the microscope doubles an object; the space between the two is like the space between two powers of magnification, where neither view is clearer than the other. Just as microscopical vision entails a disruption of semblant objects as it breaks the surface of perception, "Benito Cereno" entails a disruption of the figurative, as the literal—the empty space that organizes perception and figuration—emerges.

One of the more provocative lines of argument I have developed concerns how the microscope upset idealist hierarchies and the privileging of the whole over the particular. The “rise of the small” demonstrates how the particular has been traditionally suppressed in the history of Western metaphysics. By turning to Emily Dickinson’s irregular and rule-breaking poetry, with its emphasis on the small, the momentary, and the *heimlich*, I correlate the status of the particular with that of the aesthetic detail. The detail provides an especially troubling problem for both editors and readers of Dickinson’s poems, as it points to the difficulties of fixating authorial intent, limiting grammatical play, and determining meaning. Looking at relevant intertexts on the detail from Naomi Schor, Susan Sontag, and Sarah Kofman, I put my study of the unique ideas of particularity produced by the microscope into conversation with an on-going discourse regarding the status of the small as a historically feminized concept that, when challenging metaphysics, consequently challenges masculine metaphysical schemata.

As Fred D. White notes, “[f]ew poets in the twentieth century, let alone the nineteenth, have incorporated scientific concepts into their work as purposively and effectively as Emily Dickinson” (121). From her uncommonly advanced education in the sciences at both Amherst Academy and Mount Holyoke Female Seminary, Dickinson developed a command over sophisticated scientific theories and their relevant technical vocabularies. She sought out and studied a wide range of scientific topics, such as biology and medicine, botany, geology, electricity, and chemistry, and her family, along with its ties to Amherst’s educational institutions, likely encouraged and supplemented her scientifically-minded intellectual pursuits. Roughly 250 of Dickinson’s poems touch on scientific themes, where such concepts are brought to bear on speculations of the afterlife, of human frailty and the limits of knowledge, and on the value of religious certainty in the face of destabilizing scientific discoveries. Of the many scientific topics in which Dickinson’s poems and letters express interest, optics stands out as particularly relevant to my study of the microscope.

Dickinson’s knowledge of optics and instruments like the telescope and microscope is fairly well documented. Also well documented is her life-long struggle with an indeterminable and painful eye condition; she spend considerable time outside of Amherst undergoing medical treatment for her fatiguing eyes, and descriptions of the experience can be found throughout her letters. Her eye-illness may have heightened her thoughts on vision, as she employs optical imagery profusely and describes in great detail images of darkness, disappearance, and invisibility. She works out something like a theory of seeing that scholars refer to as “compound vision,” a phrase that refers to the simultaneous perception of visible-empirical objects and invisible-spiritual objects, the former seen in the light, the latter seen in the dark. The phrase further indicates the poet’s familiarity with optical instruments, the basic construction of which includes the combinations of lenses. Thinking through Dickinson’s thematic uses of vision in combination with her profound interest in the sciences leads me to a focused reading of those poems that exhibit knowledge of optics.

The poems on optics display a deep-seated tension that Dickinson felt in the confrontations between science and faith. Because looking through the microscope provides the user with a power traditionally reserved by God—seeing that which “[e]yes were not meant to know” [451]—its use is marked by a kind of spiritual defiance. Some of Dickinson’s speakers fear this power and dread that the extension of sight could lead to the unmasking of the individual’s intimate world, exposing one’s most well hidden secrets. Others find that the powerful increase in vision is accompanied by a powerful increase in curiosity, that the disclosure of what has never been seen reveals not only the great extent of what we do not know, but also how much we have yet to learn. Taken together, Dickinson’s optical poems present a struggle to reconcile science and faith that I argue is shaped by the poet’s unique position and interest in the small. Her detailed poems affirm the power and positivity of particularity as they work out a balance to the discursive conflicts embodied by the microscope, between small and big, visible and invisible, science and faith.

My reading of Dickinson carries over to the study’s conclusion, where I address an assumed premise of the work and a controversial topic in contemporary literary analysis: the issue of scale. In this Epilogue, I consider the recent discourse between Wai Chee Dimock and Mark McGurl over the model of criticism termed “deep time.” Building off of historian Fernand Braudel’s notion of the *longue durée*, Dimock argues that expanding the scales of analysis to reach beyond falsely assumed geological and temporal boundaries will allow scholars to remap hidden connections amongst authors, events, and ideologies while recuperating productions of meaning that are categorically denied by small-scale analysis. Mark McGurl, however, finds Dimock's reliance on the *longue durée* to be itself short-sighted, and suggests we "radicalize" the deep time approach to include both pre- and post-human epochs; by setting the boundaries of the scale with the Big Bang on one side and the death of the earth's sun on the other, McGurl tests what he sees as the necessary existential limits of analysis. Dickinson's poetry, with its interest in the minute and the detail, and its preoccupations with questions of death, vastness, and the universe, presents readers with a unique contribution to the discourse on scale. Like Dimock and McGurl, the poet turns the end points of deep time into existential qualifiers, where the scales of analysis find meaning only in their value to lived experience. The cosmic vastness that is displayed by optical instruments and that threatens to annihilate the significance of human intellectual pursuits was something that greatly concerned Dickinson. Following Dickinson's lead, I argue that the "scaling-up" of the universe is best addressed in existentialist terms.

I don't know exactly where this study lands as a configuration of interdisciplinary research. I have tried to show how the science of microscopy explains a number of philosophical and artistic expressions, but also how the conceptions performed in works of art and philosophy explain the science of microscopy. I occasionally hesitate to make explicit causal connections, yet think it is important to display the historical-cultural framework conditioning each author's direct manipulation of the instrument. My tendency towards pluralism leads me to think that adherence to limited theoretical models is unproductive, and the search for direct causal connections unrewarding, yet also find that the inferential juxtaposition of thoughts may unjustifiably make of history a matter of taste. In addition to these methodological complications is the problem of the "common thread," that which works to link each chapter, rhetorical move, and conclusion together in what may only appear to be a disinterested manner. The common thread of the microscope here involves a narrative—from the philosopher, to the scientist, to the novelist, to Dickinson the poet (providing the final word)—in what could be interpreted as a narrative of increasing privilege. That criticism I do not deny.

For the romantics, allegory named a static, limited, and direct correspondence between terms, while symbolism was characterized by organic, open, and fluid relationships; thus Ahab can only be understood as marked by the White Whale, and Moby Dick only understood as the object of Ahab's pursuit. This is how I understand the "common thread" of the microscope, as productive of ideas while receptive of them, as triggering actions on the parts of scientists, philosophers, and artists, while itself defined by and embodying those ideas. Here, then, is an interdisciplinary twist on Peirce's pragmatic maxim as it appears in "How to Make Our Ideas Clear":

> Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object. (5.402)

The conception of the microscope must include its multifarious effects. These, I hope, have been successfully brought into focus.

Chapter 1.

"The sublime was in a grain of dust": Emerson and Macroscopical Metaphysics

It sounds like a very Emersonian thing to say. Compare it, for example, with the well known lines from "Compensation": "[t]he world globes itself in a drop of dew" and "the universe is represented in every one of its particles" (*W* 2:59). The idealized correspondence of microscopical and macroscopical worlds is a belief Emerson expressed time and time again, such as in "The Poet," the figure who,

> through that better perception … stands one step nearer to things, and sees the flowing or metamorphosis; perceives that thought is multiform; that within the form of every creature is a force impelling it to ascend into a higher form. (*W* 3:20)

The insight is one that suggests totality, the Over-Soul, the incalculability of all things according to the multiformity of their natures; it highlights the projection of a macroscopical mode of viewing onto objects of immediate perception, construing a thing's very ontology through a mediating ideology of spiritual transcendentalism. Simply put, the phrase I use as my chapter title encompasses in succinct manner Emerson's transcendentalist metaphysics along with his theory of symbolism. And yet the poetic and philosophical weight of this phrase—"The sublime was in a grain of dust" (*W* 5:9)—was not made explicit by Emerson when he documented it in the opening pages of *English Traits*; in fact, he recognizes the statement as interesting enough to include in the work, but ultimately will pass it over, unwilling to detail the multiformity of the thought. Perhaps this is because Emerson, upon hearing Walter Savage Landor utter this phrase to him in May of 1833, had not yet composed the works that later readers might refer to when charging the insight with meaning. Or perhaps, and despite the fact that Landor was a poet whom Emerson admired, the reason the insight was overlooked had more to do with the source of its inspiration rather than the poet who said it: the statement was borne out of a reaction to a different method of perception—namely, microscopy.

The New Microscopy: Emerson and Science

When Emerson had first toured Europe in 1833, he was inspired by a wish to "see the faces of three or four writers, —Coleridge, Wordsworth, Landor, De Quincey, and … Carlyle" (*W* 5:4). He was at the same time animated by a wish to recuperate from two recent traumas: disengagement from the Second Church, provoked in part by his turn to Carlyle's writings (what Albert von Frank calls "his new discovery" (67)), and the tragic death of his first wife Ellen Tucker, who died of consumption only seventeen months after their marriage. Coleridge he met in the North London area of Highgate on the morning of August 5, 1833. Though clearly anticipating this meeting—he had read Coleridge's *The Friend* a few years earlier "with great interest" (von Frank 45)—Emerson found the visit disappointing, describing it as "no use beyond the satisfaction of my curiosity," and describing Coleridge as "old and preoccupied, [he] could not bend to a new companion and think with him" (*W* 5:14). He called on Wordsworth at Rydal Mount later that month, August 28, where they walked around the poet's little home and alongside Rydal Water, down the path where Wordsworth had "composed thousands of his verses" (Downs 14).[59] Years later the two would meet again at Wordsworth's Ambleside cottage, spending an hour and half together on February 27, 1848. Emerson also met with De Quincey during this second trip to Europe, dining with him on two occasions in February of that year.[60] He was likely most eager to meet Carlyle—Carlyle's work became for him a chief source of inspiration—which he did in late August, 1833, at his home in Craigenputtock. Both Thomas and his wife Jane instantly took to Emerson; they dismissed his carriage and insisted that he stay overnight. Jane even claimed that Emerson had descended "on us, out of the clouds, as it were, and made one day there look like enchantment for us, and left me weeping that it was only *one* day." Her husband

[59] This description comes from Annie Sawyer Downs. Her account of Emerson's meeting with Wordsworth can be found in "Reminiscences of a Childhood in Concord in the 1840s," included in *Emerson in His Own Time*. "Bend" refers as much to Emerson's teasing of Coleridge's sense of superiority as to his physical infirmity, and is just one of many examples of sarcasm found throughout *English Traits*. See *W* 5:10-4.

[60] See von Frank 227-8.

had called Emerson "a beautiful transparent soul," and this meeting led to a regular and fruitful correspondence lasting nearly forty years (qtd. in Porte 3).

All of these visits took place in the United Kingdom, but Emerson had spent considerable time on the continent prior to his arrival there. Having landed in Malta in early February, Emerson enthusiastically "worked his way north through Italy, Switzerland, France, England, and Scotland" (Porte 35), and while in Florence, met with Landor through their common friend Horatio Greenough, a handsome American sculptor whom Emerson describes in *English Traits* as "chief among artists" (*W* 5:5). The three breakfasted together at Landor's villa at San Domenica di Fiesole, as the "noble and courteous" host entertained them by "reciting a dozen hexameter lines of Julius Caesar's," offering his opinions on Burke, Socrates, and Washington, as well as Greek sculpture, English poetry, and Italian botany (*W* 5:8). During their talk, Emerson brings up a name—partly to interest Landor and partly to tease him—of a man he recently visited, a name that does not appear on Emerson's wish-list, nor in von Frank's seemingly comprehensive *Chronology* of Emerson's life: Professor Giovanni Battista Amici, Italy's most eminent designer of microscopes.

Amici kept in his Florentine workshop a small notebook where he recorded the names of visitors, their meetings, and their purchases. The meeting between Amici and Emerson appears in an entry for May 10, 1833. Emerson had also included this meeting in his own journal entry of May 10, 1833, writing,

> Journal Italy and France – {18} [May] 10, 1833.
>
> Visited Professor Amici & saw his optical instruments. He is reputed the maker of the best microscopes in Europe. He has also made a telescope for Herschel in London. He has a microscope whose magnifying power is 6000 diameters, or 36,000,000 superficies. To instruments of this enormous power he applies the camera lucida & then draws the outline of the object with pencil.
>
> His experiments upon polarised light are beautiful.
>
> The price of his best instruments is 800 francs. He has just made one for Dr Jarvis for 45 dollars. (*JMN* 4:170)

The bulk of these details do not find their way into *English Traits*; Emerson simply includes that "I had visited Professor Amici, who had shown me his microscopes, magnifying (it was said) two thousand diameters; and I spoke of the uses to which they were applied" (*W* 5:8-9). He is also inconsistent: in his journal the instrument can magnify up to six thousand diameters, while in *English Traits* it appears to have lost some power, down to two thousand. In any case, this meeting is significant in that it indicates how Emerson's concern with, and general ambivalence towards, natural science began much earlier in his career than generally supposed, and that he had confronted microscopy, what I see as a particularly frustrating branch of science for Emerson, at an equally early stage of his philosophical development.

When Emerson met Amici in 1833, microscopy was entering its second period of increased activity, a "new microscopy," a revival of sorts generated by developments in the achromatic lens system that promised to overcome lingering problems of optical aberration. Since the publication of Robert Hooke's *Micrographia* in 1665, perhaps the most recognizable work associated with the early flurry of microscopical activity in the seventeenth century and bookending what is now called the microscope's "golden age," instrument makers made very little improvement to the optical systems of their microscopes, and instead concentrated on altering mechanical features, like mounts, support mechanisms, focusing sliders, and mirror attachments. This is chiefly because optical aberration was generally considered unavoidable, an unfortunate but manageable hurdle attributed to the glass used in the production of lenses. Though vast improvements were made to lenses since the initial assembly of the simple convex, like the application of bi-convex and plano-convex lens types, the obstacles remained substantial. John C. Dalton, America's first professor of physiology, had summarized the technical difficulties associated with optical aberration that hindered the science just prior to his generation in 1856, the same year Emerson published *English Traits*:

> The compound microscope, indeed, was almost useless, owing to the serious and apparently insurmountable difficulties of spherical and chromatic aberration … microscopic investigation seemed to be arrested by a natural barrier that offered but little prospect of ever opening a way to further prosecution of the science. (qtd. in Cassedy 76-7)

The want for greater clarity of the microscopical image grew, however, and with the return of instrument makers to reconsider the microscope's optical components came the production of the achromatic lens, what Catherine Wilson describes as "a response to a new demand [rather] than a condition of productive investigation" (249). The achromatic microscope, the result of this response, ultimately became the nineteenth century's chief development in microscopy.

The problem of chromatic aberration, briefly put, is that the images produced by early compound lens systems were unable to properly focus the differing wave lengths of colors comprising the beam of sunlight passing through the lens. Rather than a single focused image, a viewer would see superimposed images in red, orange, yellow, green, blue, and violet wavelengths, causing distorted fringes of light at the edges of the microscopical object.[61] Several makers experimented with alternative lenses in their attempts to reduce aberration. Stephen Gray, for example, by staging a drop in a small hole grinded into a metal plate found some success in his microscope with "congrous properties, known to be in small drops of water, viz. transparency, refrection, [*sic*] and spherility" (281). Liquids other than water were tested for their magnifying power, such as oil of amber, turpentine varnish, copal, and Canada balsam, and the crystalline lenses of small fishes and eels (that is, some experimenters tried looking through fish and eel eyes for magnification). The most important attempts at using non-glass materials for lenses were made in the nineteenth century, when instrument designers tried lenses worked from jewel stones, especially sapphire, ruby, topaz, and diamond.[62] However, makers like Pritchard and Varley in England, Chevalier and Oberhauser in Paris, and

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[61] See Gamwell 49-50.

[62] See Clay and Court 76. Thomas Dick, in his *The Telescope and Microscope*, quotes Sir. D. Brewster with suggesting, at sometime around 1820, that "we cannot expect any essential improvement in the single microscope, unless from the discovery of some transparent substance, which, like the diamond, combines a high refractive power with a low power of dispersion" (qtd. in Dick 102). Dick then explains that, in correspondence with this suggestion, a Mr. Pritchard of London undertook the project, and "notwithstanding the difficulty of working this substance into a perfect figure…finished the first diamond microscope in 1826" (102). This is the same year in which Cornelius Varley, the well known water-color painter and microscope enthusiast, was urged to construct his own diamond lens, which, according to his unpublished autobiography, he relegated to his pupil. After working at the lens for a long time, Varley gave it up, seeing no potential in the diamond lens that could supersede the developments in achromatic glass lenses. "Such lenses," according to Clay and Court, "should have a superiority over glass lenses of equal power, as owing to their higher refractive index their curvature will be less, and therefore their aberration should be less. Also their dispersive power is less, so that the chromatic errors should also be less" (76). Dick agrees, adding, "The principle advantages of employing diamonds in the formation of microscopes arise from the naturally high refracting power they possess, by which we can obtain lenses of any degree of magnifying power, with comparatively shallow curves." Dick also mentions here that Pritchard "had also formed lenses of sapphire and other precious stones, but they are not preferable to the diamond" (102-3).

Plossle in Vienna, found that "apart from the difficulty of manufacture, such lenses suffered from defects due to the material. All crystals which belong to any but the cubic system are doubly refracting, and unless cut exactly perpendicular to an optic axis, will give a double image" (Clay and Court 76). Perfecting these lenses proved both difficult and expensive, and, as Clay and Court put it, the "rapid improvements in the construction of the achromatic objective at about this time … put an end to the attempts to make jewel lenses" (77).

Around 1830, Joseph Jackson Lister, a London wine-merchant and amateur microscopist, introduced a theory of aplanatic focal points to the approach of Charles Chevalier, a Parisian instrument maker who worked on and sold microscopes with achromatic lenses as early as 1823, that Savile Bradbury argues "opened [the way] for the construction of high aperture, well-corrected lens systems" (28).[63] "Microscope objectives consisting of systems of achromatic doublets," writes Stuart M. Feffer, "quickly became the norm in the more expensive compound microscopes" (25). This achromatic type microscope then "rapidly increased in popularity during the 1830s, replacing simple microscopes as the instrument of choice for virtually all types of practitioners" (Feffer 25), and thus soon "removed the prime need for mirror systems which were costly and more difficult to make, as well as being more awkward to use" (Bradbury 28). Alternative lenses were not the only items to fall out of vogue due to the progress made with achromatics. So too were reflecting microscopes, the type Amici became famous for making.

The reflecting microscope was invented in the later part of the seventeenth century and its usefulness was sustained by consistent improvements to its basic design. This type, like the achromatic microscope, was conceived from attempts at nullifying image aberrations. Working from versions of reflecting telescopes and his theory of light and color, Isaac Newton proposed that if the light illuminating an object was reflected off of a concave mirror rather than passing through a lens, certain aberrations could be

[63] See Feffer 25.

significantly reduced.[64] The experiments with reflectors were relatively successful, and when attempts to create achromatic lenses proved more challenging prior to Lister's breakthrough, many instrument makers, like Giovanni Amici, concentrated on the reflecting microscope. In most cases, the center of the field was generally free from aberration, though points towards the margins were not. However, satisfactory elliptical mirrors were difficult to produce, consequently impeding the reflecting microscope from achieving results that could be said to be better than non-achromatic objectives constructed at the same time; so when further experiments with achromatic lenses proved it possible to eliminate aberration, reflecting systems were largely abandoned.[65] Amici, who made his name with the reflecting microscope, did attempt to construct his own achromatic versions, but, according to Bradbury, he "despaired of achieving satisfactory results" (27-8). Even after hearing of Chevalier's progress with achromatic lenses in 1824, Amici continued to work on his reflecting microscope, and though he did significantly reduce chromatic aberration, his instruments tended to "suffer considerably from coma and astigmatism" (Bradbury 28).

The reflecting microscope, then, is the type of instrument Emerson most likely examined while meeting with Amici in 1833. The year of this meeting is significant because it places Emerson in a microscope workshop during a period when makers were developing an instrument that would not only restore scientific esteem to microscopy by contemporary naturalists, but would do so by opening a "crystal-clear window" into the microscopical realm and by disclosing, with remarkable clarity, what was previously invisible. Lynn Gamwell, in her essay "Beyond the Visible: Microscopy, Nature, and Art," describes the effect that the achromatic microscope had on microscopists in the 1830s:

> For the first time, microorganisms were seen in brilliant natural color and immaculate detail. Earlier naturalists had barely been able to make out cell walls. But in 1838, the German physiologist Theodore Schwann and botanist Matthias

[64] The date of Newton's discovery of the reflecting microscope appears to be a matter of debate. Clay and Court assume the date to be 1679 from a description in a letter written by Newton to Henry Oldenburg, Secretary of the Royal Society, during that year, but John Quekett, in his *Practical Treatise on the use of the Microscope*, argues for 1672. Still others claim that the proposal was not made until 1692.

[65] See Clay and Court 229-35.

> Scheiden could see details of intercellular bodies so clearly that they confidently announced a fundamental fact of biology—all living tissue is composed of cells. During the first decade of the achromatic microscope, pictures of sea creatures invisible to the naked eye were engraved after drawings made by the German biologist C.G. Ehrenberg while looking through a microscope. The subtle coloring and fine detail of these famous pictures proclaimed the fascinating world that now opened before scientists, artists, architects, and the general public. (49-50)

After nearly one hundred years of dormancy, the achromatic microscope marked a breakthrough in microscopy. Throughout the remainder of the nineteenth century, the instrument would become a fixture of nearly every discipline of natural science. Gamwell is right to point out that the solution of chromatic aberration drew attention not only from biologists and naturalists, but artists, philosophers, and the general public as well.

That major developments in microscopy would inform those made in biology and other natural sciences is hardly surprising. But that poets and philosophers like Landor and Emerson would also seriously consider the possibilities of expanding human vision is somewhat less appreciated. Landor's statement that Emerson includes in *English Traits*—"the sublime was in a grain of dust" (*W* 5:9)—is reminiscent of his contemporary William Blake's poem "Auguries of Innocence," which begins, "To see a World in a Grain of Sand / And a Heaven in a Wild Flower / Hold Infinity in the palm of your hand / And Eternity in an hour" (1-4).[66] The insight expressed by Blake and Landor above, and Shelley below,[67] is the recognition of the whole *in* the particular, the incalculable sublime *in* a grain of dust, an entire world *in* a grain of sand, or "Infinity *in* the palm of your

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[66] This is to say that Blake had also conceived of the kind of insight voiced by Landor and documented by Emerson, and similarly expressed it through an image representative of microscopical examination. Emerson likely did not read "Auguries of Innocence" prior to writing *English Traits*. Though Blake probably wrote the poem sometime around 1803 in a notebook now known as "The Pickering Manuscript," it was not published until 1863. However, Emerson undoubtedly read Blake with interest, as his copy of Blake's *Songs of Innocence and Experience*, given to him by Elizabeth Peabody in 1842, is laced with notes in Emerson's hand.

[67] In addition to Shelley, Blake, and Landor, numerous eighteenth and nineteenth century poets had woven microscopical knowledge into their works, often contemplating how the complexity of minute structures represents the sublime, or the magnificence of creation. Sir Richard Phillips, in his 1811 treatise titled *The Wonders of the Microscope*, collected several instances where the microscope appears in the poetry of Richard Savage (1697-1743), James Thomson (1700-48) Moses Browne (1707-87), William Cowper (1731-1800), and Anna Laetitia Barbauld (1743-1825). Later nineteenth century poets who referenced microscopes include James Russell Lowell (1819-91) and Emily Dickinson (1830-86), among others.

hand" (Blake 3).[68] The microscope becomes a source for literary and metaphorical treatment. The discovery, as Shelley wrote in "Queen Mab," that "the fragile blade of grass" is "an unbounded world" (2.227-30), inspired poets and philosophers to rethink the dialectic of the whole and the particular in creative and novel ways, articulated through a shared reference to microscopy. And it is this insight regarding the metaphysics of whole and particular that makes Landor's statement sound so Emersonian. Emerson had always emphasized the notion of recognizing the whole within, or despite, the particular—it becomes axiomatic in his thought, working its way into his metaphysics, aesthetics, ethics, politics, and, naturally, his opinions of science. "Nature," for example, is laced with passages exemplifying this primary tension between the phenomenal appearances of the world as individual, discrete, or detached and the metaphysical truth that all things progress towards "that ineffable essence which we call Spirit" (*W* 1:61). The notion of Spirit is something like Emerson's First Principle: "Man is conscious of a universal soul within or behind his individual life, wherein, as in a firmament, the natures of Justice, Truth, Love, Freedom, arise and shine" (*W* 1:27). In fact, he writes, the "single object is only so far beautiful," which also means, for Emerson, receives any type of ontological status, "as it suggests this universal grace" (*W* 1:24). When Emerson had spoke with Amici of "the uses to which [his microscopes] were applied," he must have contemplated how they represent this foundational principle, how they reveal the multiformity hidden in particular objects, how the microscope embodies or substantiates his thinking, and how he might employ the instrument as a metaphor expressing this basic insight.

Yet even if Emerson had seen in the microscope a representation of this thought, or a satisfactory means of confirming his theory of nature, he appears more than merely hesitant to give the instrument too much credit. The microscope was, after all, a scientific instrument, and thus informed a kind of scientific engagement with the world that fostered a "mechanistic worldview" that Emerson at other times found not only

[68] I use the preposition "in" simply because this is how Landor and Blake use it. Emerson would likely articulate the insight regarding the whole and the particular with "through," though, technically speaking, I argue that "on" is most correct because the microscope only magnifies an object's surface and does not penetrate that object. Liquids, of course, offer special difficulties, so when Cotton Mather describes a drop of water as an "Ocean" to animalcules in *The Christian Philosopher*, "in" would be most acceptable, such as, "the world *in* a drop of water."

inadequate, but unethical. It's not as if Emerson was uninterested in science, or even uniformed; his meeting with Amici and his other visits to scientific institutions made during his 1833 journey through Europe suggest otherwise. While in Paris, for example, he toured the Sorbonne, meeting with the scientists Jean Baptiste Biot, Dominique-François Arago, Joseph Gay-Lussac, Antoine Laurent de Jussieu, and Louis Thénard.[69] He may even have gone "botanizaing with Jussieu" on July 14th, 1833 (von Frank 84). The day before, he visited the *Cabinet d'Histoire du Jardin des Plantes,* inspiring him to write, "I will be a naturalist" (qtd. in von Frank 83). In fact, Emerson's relationship with natural science has been a chief point of scholarly interest ever since Harry Hayden Clark's groundbreaking essay "Emerson and Science" appeared in the July 1931 issue of *Philological Quarterly*, though it took some fifty years to noticeably commence.[70]

Laura Dassow Walls summarizes why scholars were hesitant to follow Clark's lead in reading for Emerson's scientific influences, despite his accounts of visiting the Paris Muséum d'Histoire Naturelle, his familiarity with Mary Somerville's *The Mechanism of the Heavens*, J.F.W. Herschel's *A Treatise on Astronomy,* and other works by Copernicus, Galileo, Kepler, Laplace, Newton and Kant, and his numerous essays on science, like "The Uses of Natural History" and "The Naturalist."[71] In her recent book *Emerson's Life in Science: The Culture of Truth*, Walls argues that claims regarding Emerson's grounding in science sound "counterintuitive today, on two grounds":

> First … to recover Emerson's involvement with science overturns what remains of the conventional stereotypes that have dogged critical and popular opinion for 150 years: Emerson as the whimsical and fuzzy-minded idealist, too self-absorbed to attend to the outer world, to blithe to face real evil … [Second] Emerson, like most intellectuals of his day, was perfectly at ease folding scientific truth into moral truth, reading literature and science together as part of a common intellectual culture. (2-3)

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[69] See von Frank 83.

[70] See the following: Harry Hayden Clark, "Emerson and Science;" Gay Wilson Allen, "A New Look at Emerson and Science;" David M. Robinson, "Emerson's Natural Theology and the Paris Naturalists: Toward a Theory of Animated Nature;" Christopher J. Windolph, *Emerson's Nonlinear Nature*; Mark Noble, "Emerson's Atom and the Matter of Suffering;" Laura Dassow Walls, *Emerson's Life in Science: The Culture of Truth*; William Rossi, "Emerson, Nature, and Natural Science."

[71] See Walls 2, and Windolph 40.

Walls's first reason for why it appears counterintuitive to view Emerson as significantly engaged with science is obvious enough; Emerson himself had regularly disagreed with the concept of philosophical system-building, holding on to the possibility of altering his positions at will, a manner that lends itself to the caricature of Emerson as the "fuzzy-minded idealist," one who substitutes poetic license for sober philosophical exposition. The second reason is, according to Walls, really a product of the tendency of modern readers to let the "divorce between 'the two cultures' of literature and science" (3) direct their understanding. Emerson, by contrast, may not have felt that his philosophy was influenced by a distinct field called "science" because he saw little qualitative difference between the two.[72]

"Modern science," writes Catherine Wilson, "is skeptical, methodical, and quantitative. It is engaged in a constant process of self-revision, which it carries out by designing critical experiments involving physical objects and by tabulating and analyzing mathematically the products of its method" (6). These three features of modern science, Wilson argues, began to coalesce in the seventeenth century, during a period she defines as "protoscience," motivated by "the forceful and striking introduction of the discourse of skepticism" (6). The scientist, put simply, seeks general laws through a methodology defined by skepticism and self-revision; a method Emerson would no doubt be drawn to considering his commitment to a Heraclitian metaphysics of perpetual change. Emerson was always mindful of the "law of eternal procession" and the "flux of all things," and sought to qualify and embrace the "universal soul within or behind [man's] individual life," the "Highest Law" governing nature's mutability.[73] And though he was by no means an "inductive scientist," approaching natural history, as Clark notes, "with a method essentially *a priori*, ethical, and deductive, like that of Plato, Schelling, Goethe, Kant, and Coleridge" (qtd. in Windolph 40), the basic impulse driving his articulation of nature parallels the scientific ethos of resisting claims of finality while speculating and

[72] See also Windolph, who argues that scholars have characterized Emerson's interest in science "as being almost exclusively a subset of his theology, and [have] (unintentionally) helped to limit subsequent inquiry on the subject mostly to his early career" (40).

[73] "law of eternal procession" ("Circles" *W* 2:186); "flux of all things" ("Nature" *W* 1:27); "universal soul within or behind [man's] individual life" ("Nature" *W* 1:27); "Highest Law" ("The Over-Soul" *W* 2:160).

forming general laws to be tested and revised. Take, for example, the following passage from "Circles":

> Every ultimate fact is only the first of a new series. Every general law only a particular fact of some more general law presently to disclose itself. There is no outside, no enclosing wall, no circumference to us. The man finishes his story, — how good! how final! how it puts a new face on all things! He fills the sky. Lo! on the other side rises also a man, and draws a circle around the circle we had just pronounced the outline of the sphere. (*W* 2:181)

The drawing of a circle here represents the proposal of an expository theory, the statement of a general law, that Emerson argues is never finalized; natural laws disclose still more general laws, a wider circle may always be drawn. In this way, discernible parallels may be drawn between Emerson's philosophy and the methods of science: both are charged by an implicit discourse of skepticism and animated by the resistance to finality. A theory of nature can never be comprehensive, can never be unconditionally true.

Emerson, then, likely recognized in natural science the practice of discerning laws in such a way that never forecloses a law's mutability, and as such, "science," when thought of as a generalized method, practice, or mode of engagement with the world, is not remarkably different from Emerson's own account of nature; change is the only constant, but that is not to say we cannot draw out the progressions and movements of natural laws, that we cannot learn from the diversity of such modes of engagement. But microscopy, unlike this concept of "science," is not in the habit of turning its gaze back to the whole, or to the universal law of spirit directing nature's transformations. When scholars attempt to derive Emerson's negative attitude towards science, they cite examples like the following from "Nature":

> Empirical science is apt to cloud the sight, and, by the very knowledge of functions and processes, to bereave the student of the manly contemplation of the whole. … For, the problems to be solved are precisely those which the physiologist and the naturalist omit to state. It is not so pertinent to man to know all the individuals of the animal kingdom, as it is to know whence and whereto is this tyrannizing unity in his constitution, which evermore separates and classifies things, endeavoring to reduce the most diverse to one form. When I behold a rich landscape, it is less to my purpose to recite correctly the order and superposition of the strata, than to know why all thought of multitude is lost in a tranquil sense

> of unity. I cannot greatly honor minuteness in details, so long as there is no hint to explain the relation between things and thoughts. (*W* 1:66-7)

Emerson becomes dismissive of "empirical science" when its practitioners neglect to qualify their conclusions regarding the minuteness in details against the backdrop of the "tranquil sense of unity" characterizing the Over-Soul. And it seems to me that microscopy, more so than any other method of science with which Emerson was familiar, emphasizes this particular feature that he here faults. A few passages earlier, he states, "Therefore the soul holds itself off from a too *trivial* and *microscopic* study of the universal tablet" (*W* 1:60—my emphasis), exemplifying how, despite his congruency with foundational qualities of scientific investigation, the microscope still warrants cause for alarm. The microscope gazes at the *small*, and the small is *trivial*, unimportant; it distracts the soul from *bigger*, more *important* concerns.

Etymology, Entomology, Dissection

The microscope no doubt speaks to the skeptical attitude compelling empirical science. The disclosure of the microworld demanded reconsiderations of an object's ontological status: things became places, habitats for microorganisms; placid surfaces were revealed as irregular and non-continuous, composed of little mountains and valleys which, Wilson suggests, provoked "an argument against the Aristotelian theory of homogeneous substance" (57); uniformity became an illusion. The animalcules observed living throughout these little mountains and valleys put pressure on systems of biological classification that were codified and established prior to the discovery of them. In short, the microscope "brought into being new phenomena … and when they could not be fit into preexisting systems, then systems were made around them" (Wilson 252).[74] Like science, Emerson's philosophy allows for such revisions generated by discovery to be made; an established system regarding nature is just one circle, just one series of facts. But unlike Emerson, who always deduces such particulars from their relation to the all pervasive Spirit uniting them, the microscope does not return its gaze to the whole, but

[74] These are only a few examples; the microscope forced scientists in all fields to revise certain standardized definitions of their objects.

dwells only with the particular. As such, it becomes a source of Emerson's ambivalence with a certain manner of thinking that is conditioned by the tense particular/whole dialectic, and becomes a foil standing in for his other hesitations with science generally conceived. That is, the microscope comes to represent those issues of unacceptable particularity he associates with science, proving it an unsatisfactory mode of engagement with the natural world. This ambivalence surfaces in his exchange with Landor.

"Landor despised *entomology*, yet, in the same breath, said, 'the sublime was in a grain of dust'" (*W* 5:9—my emphasis). Emerson's reference to Amici prompted Landor to reveal his contempt for *entomology*, a word whose etymological roots point to what I see as the root of Emerson's resistance to microscopy. Entomology is the study of insects. "Insect" comes into English through the Latin *insectum,* an elliptical for *animal insectum,* or "animal notched or cut into" (Pliny); *insect-us* is the past participle of *insecāre*, to "cut into," a rendering of the Greek *ἔντομον,* or *entomon,* insect (Aristotle). *Entomon* is worked from the combining form of the Greek adjective *ἔντομος*, "cut up." The Greek *εντομολογία*, entomology, is thus a combination of *entomo*- and -*λογία* (-*logie*, -logy), rendering something like "the science of incision, of cutting up." So entomology does not merely refer to the science of insects, but to the science of cutting up, of dissection, of taking a part from the whole. The etymology of *microscope* follows a similar line of thought, formed from the combination of *micro*-, from the Greek *μικρός*, "small," which is perhaps related to classical Latin *mīca* for "grain, crumb particle," and -*scope*, representing modern Latin -*scopium,* from the Greek *σκοπεῖν*, to "look at, examine" (*OED*).

It makes sense that Landor would immediately associate entomology with the microscope, for, as explained above, when the instrument initially became widely used during its seventeenth century "golden age," the first prime subjects for observations were insects—usually fleas, lice, flies, moths and bees. When the Royal Society was founded in 1660, just five years prior to the publication of Hooke's groundbreaking *Micrographia*, and up to its early eighteenth century "Newtonian phase," the Society was, according to Wilson, less concerned with "the luminous and remote objects of celestial mechanics" (ix)—what Emerson likely has in mind when conceiving of nature's "tranquil sense of unity"—and focused instead on dissected parts of plants and embryos, little pieces of animals like flakes of skin, hair, bone, and organs. Early microscopists performed the kinds of actions signified by entomology, in its Greek and Latin senses, even when observing non-entomological objects. The point is that use of the microscope is always in a sense entomological, predicated on an engagement with the world conceived of as constitutive of particular and detachable components. To push this insight a bit further, one might argue that the very process of etymology, and thus the intellectual authority granted to the literary critic's employment of etymological techniques, is a kind of entomology, especially when tracing the roots of compound words. Both require dissection, the pulling apart of a perceptible whole.

The dialectic of whole and particular again emerges in Emerson's rendering of Landor's expression, "Landor despised entomology, yet, in the same breath, said, 'the sublime was in a grain of dust'." A single breath holds together two seemingly oppositional positions: the entomological, conveying notions of division, dissection, and particles, and the sublime, indicating the highest regions of thought, reality, or human activity, the overwhelming sense of infinite power provoked by that which cannot be counted, calculated, or even thought, and yet is nonetheless disclosed by the microscope. Voicing this tension through a poet suggests that the sublime is a matter for artists, fostered by the soul's desire to transcend trivial, microscopical study of the universal tablet. While Emerson recognizes the significance of the particular, he clearly deduces its importance from an established emphasis on contemplation of the whole. The microscope, however, is only an instrument of magnification, rendering a necessarily narrow view that can only contemplate the particular. What Hooke, Leeuwenhoek, and others looked at was precisely the opposite of what Emerson argues we should look at; their work was motivated by a desire to examine the part, to extract it from the whole.[75] So while Emerson cannot be said to dismiss "science" completely, it appears possible to demonstrate a particular dislike for microscopy.

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[75] In reference to one of Emerson's better known metaphors, which I detail below in my discussion of his theory of symbolism, microscopists looked at farms rather than landscapes.

"The eye too near …"

My project is not to reveal science as some unexamined feature of Emerson's thought, but rather to think through the consequences that an examination of microscopy might have on reading his works. I hope to discern his attitudes towards the information produced by the microscope, to see what he thought about it in different periods of his development, and how it might have informed his positions concerning science, vision, symbolism, and the dialectical relation of part and whole. My leading question, then, is how does Emerson employ microscopical terminology?

Emerson had certainly cultivated a working knowledge of microscopy early in his career; he owned at least one microscope that he kept in his study and he familiarized himself with the works of first generation microscopists such as Hooke, Leeuwenhoek, Malpighi, and Swammerdam, as well as contemporary entomologists like William Kirby and William Spence.[76] He read Sir David Brewster's *A Treatise on Optics*, which provided "exact directions for microscopic investigation" (*JMN* 11:15-6). He also read and referenced Kirby's *Introduction to Entomology*, a celebrated work appearing in four volumes between 1815 and 1826.[77] In Sermon 152, he cited at some length René Antoine Ferchault de Réaumur's demonstration of the bee-cell's design, which he likely read in John Abernethy's *Physiological Lectures exhibiting a general view of Mr. Hunter's physiology and of his researches in Comparative Anatomy* (he had quoted Abernethy's commentary on the eye lenses of flies and the growth of fly larvae in Journal Q, 1832).[78]

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[76] At least two journal entries establish that Emerson owned a microscope. The first, written in the summer of 1840, discusses his son Waldo's early experiments with language: "Waldo says there is no 'telling' on my microscope meaning no name of the maker as he has seen on knifeblades, &c." (*JMN* 7:505); the second appears in a rather heartbreaking entry written two years later, just after young Waldo's death: "he had touched with his lively curiosity every trivial fact & circumstance in the household…the microscope, the magnet, the little globe, & every trinket & instrument in the study" (*JMN* 8:163-4). For sources indicating Emerson's knowledge of the "first generation of microscopists," see the following: *JMN* 4:288-9; *JMN* 5:81; *JMN* 9:410; *JMN* 11:17, 144, 451-2; *JMN* 13:267, 359; and *JMN* 16:141.

[77] See esp. *JMN* 3:164, "Blotting Book Y" 1829; *JMN* 3:342, "Pocket Diary I (PDI)" 1829? 1831?; and *JMN* 9:211-2, "Journal W" 1845. Additionally, Emerson had composed a long list of names of people he saw during his second visit to Europe in 1848, as documented in *English Traits*. Besides the names of geologists Adam Sedgwick and Edward Forbes, Emerson mentions William Spence, who had attended Emerson's London lectures and later dined with him. See *JMN* 10:362 and editors' footnote.

[78] See *JMN* 4:9, "Journal Q" 1832.

He worked much of his early reading of entomology and anatomy into his first series of lectures on science in late 1833 and early 1834.[79]

He had also described animalcules with some detail in both his journals and published works. As those books on microscopy published during Emerson's lifetime attest, animalcules were a primary source of interest, and ever since Leeuwenhoek's discovery and exhaustingly detailed descriptions of these "little animals," such works regularly included drawings of their widely ranging forms. Microscopists examined animalcule feeding habits, methods of movement and generation, organs, and qualities of luminosity, all features with which Emerson was familiar.[80] Chapter two of *English Traits*, for example, contains a description of "[t]he sea fire" that shined in the wake of the ship carrying him to England, where Emerson mentions how one could read small print by the brilliant light of "phosphoric insects" shaped like "Carolina potato[es]" (*W* 5:28). He also explains how animalcules ("small creatures") embody organs of reproduction and how they can sense. He knew about rotifers, commonly called "wheel animalcules," named for the optical illusion produced by waves of beating cilia on its head resembling a rotating wheel.[81] Despite these similarities with larger animals,

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[79] Emerson composed a list in his "Encyclopedia" notebook with the heading "Instances of Design." The following items are included:

> Expansion of water in freezing
> Uses of snow
> peculiar laws of mixture of oxygen & azote
> Cells of bees. 109° 28´ & 70° 32´
> Lenses of the eyes

The list likely indicates points he intended on including in his first series of lectures on Science in late 1833 and early 1834. Emerson used each of these examples in these lectures except for the "Lenses of the eyes," which the editors of the *JMN* specify as referring to Abernethy's commentary. See *JMN* 6:206-7, "Encyclopedia" 1824-36.

[80] The discovery of animalcules would forever change science, helping first to discern the field of biology, and then to shift general interest to this field. As discussed in the introduction, animalcules in semen, for example, prompted a revisioning of generation, where the theological systems that defined the metaphysics of human production came under fire as untenable under the microscope.

[81] See *JMN* 12:109 "Journal F. no. 1" 1836-40, and "Compensation," *W* 2:59-60. See also *JMN* 11:502, where Emerson speculates on the sex of germs:

> {270}Sex. Journal July, 1844
> How all but infinite the mystery by which sex is stamped on the germ! By what modification of thought is this caused? Impossible to trace. Here am I the child of masculine energy, & Eugene of feminine loveliness; & so in many other families.

By calling the phosphoric animalcules "potato shaped," Emerson follows suit with a practice of most microscopists who, in addition to their scientific names, normally talked about them in terms of their however, he tends to describe animalcules as the lowest form of instinctive life, "hideous savages" and "infinitely small biters" that "swim and fight in an illuminated drop of water," as they are perpetually "writhing, wriggling, devouring, & devoured" ("War" *W* 11:154; *JMN* 9:123-5, 241-2).[82] Contemplating the chaotic and ferocious world of subvisibilia inspired him to write, "[t]he microscope reveals miniature butchery" ("War" *W* 11:154), an opinion shared by the naturalist John Hill who, after observing the feeding habits of zoophytes, similarly concluded, "such a science of Butchery, so universal, so varied, and so hurried in all its parts, human cruelty itself never offered" (qtd. in Wilson 210).

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shapes, such as the "sun animalcule," the "box-chain animalcule" and the "mask animalcule." Emerson references one of the more common types, the rotifer or the "wheel animalcule," in an 1845 journal entry, when describing its reproduction process: "A dot appears in the wheel animalcule & then it becomes two perfect animalcules" (*JMN* 9:300).

"Phosphoric insects" was originally written as "phosphoric animalcules" in the 1847 journal entry:

> 16 Oct. at noon, the ship has made 1617 miles. From 9 Oct. at noon, to 16 Oct. at noon, one week, the ship has made 1467 miles. And now at night she seems to hear the steamer behind her which left port today at 2, and she is flying before this grey southwind at eleven & a half knots every hour. The sea shines tonight not only in its wake but far around wherever a wave breaks with phosphoric light. I found I could see the hour 9¾ on my watch by this light. Near {11} the equator the mate tells me he can read print by it. He describes the phosphoric animalcules when taken up there, in a pail, to be shaped like a Carolina potato. (*JMN* 10:205)

Frederic T. Lewis brings to light an interesting correspondence between Benjamin Franklin and James Bowdoin (1726-90) in which they discuss phosphoric animalcules and that, Lewis believes, establishes the period in which the microscope became common in America. Bowdoin became interested in microscopy through his neighbor Edward Bromfield, a student of John Winthrop's at Harvard, and paid special attention to the phosphorescence of sea water that he noticed occurred when dashed by oars. Rejecting the idea that the glow is caused by putrid fish particles, Bowdoin wrote a letter to Franklin in November of 1753, stating his hypothesis that "the said appearance might be caused by a great number of little animals, floating on the surface of the sea, which, on being disturbed, might, by expanding their fins, or otherwise moving themselves, expose such a part of their bodies as exhibits a luminous appearance, somewhat in the manner of a glow-worm or fire-fly…" (qtd. in Lewis 258). A month later, Franklin replied, stating, "The observation you made of the sea water emitting more and less light, in different tracts passed through by your boat is new; and your manner of accounting for it ingenious. It is indeed very possible, that an extremely small animalcule, too small to be visible even by the best glasses, may yet give a visible light. I remember to have taken notice, in a drop of kennel water, magnified by the solar microscope to the bigness of a cart-wheel, there were numbers of visible animalcules of various sizes swimming about; but I was sure there were likewise some of which I could not see, even with that magnifier; for the wake they made in swimming to and fro was very visible, though the body that made it was not so" (qtd. in Lewis 259).

[82] See "Wealth" (*W* 5:116); "Emancipation in the British West Indies" (*W* 11:143); *JMN* 9: 123-5 "Journal V" 1844; *JMN* 9:241-2 "Journal W" 1845; *JMN* 11:283-6 and 297-8 "Journal BO" 1850. See also "Goethe; or, The Writer," where Emerson distinguishes man from animalcule in terms of biological complexity: "Man is the most composite of all creatures; the wheel-insect, volvox globator, is at the other extreme" (<u>Representative Men</u>, *W* 4:290). The "volvox globator" is a species of the genus *Volvox*, a genus of chlorophytes (green algae) first documented by Leeuwenhoek in 1700 and later named by Linnaeus. See David L. Kirk, *Volvox: Molecular-Genetic Origins of Multicellularity and Cellular Differentiation*.

Additionally, Emerson frequently employed microscopical knowledge to advance various insights, specifying apparatuses such as solar microscopes, camera obscuras, and magnifying glasses, and oftentimes likening these instruments to the poet's ability to encompass multiple points of view: for example, in "Poetry and Imagination," he writes, "The poet … is most pro-found and most devout. Passion adds eyes; is a magnifying-glass" (*W* 8:10); or in a journal entry worked into "Nature": "Make a very slight change in the point of view, & the most familiar objects are the most interesting … In a camera obscura, the butcher's cart & the figure of one's own barber or washerwoman delight us" (*JMN* 4:323); or in a review of Goethe that appears in an 1843 journal entry, "he is a poet, possesses the highest poetic talent of all his contemporaries, & *under* this genius of microscopes (his eyes are microscopes) strikes the harp with a man's strength, variety, & grace" (*JMN* 9:43).[83]

One of his favorite uses of the term "lens" is as a metaphor to illustrate the correspondence he finds between the mind and universal or divine laws. He began thinking of the mind as a kind of focusing instrument as early as 1826, when he wrote: "Minds are lenses of diff[erent]. convexity—rays of truth" (*JMN* 6:31).[84] By 1835, he had expanded the metaphor to represent, or at least resemble, the action of using a microscope: "The human mind seems a lens formed to concentrate the rays of the Divine laws to a focus which shall be the personality of God … must that ever be the effort of a good mind" (*JMN* 5:83-4). A good mind is one in which divine laws converge, just as the lens of a microscope converges light to magnify its objects of focus. A few years later, Emerson would again employ this metaphor to illustrate how the "Worshipper … of truth & of Virtue" is a lens through which "the whole world converts itself" and "the rays of the Universe … converge, whithersoever he turns" (*JMN* 7:51). For Emerson, the mind of the scholar is of the type through which universal laws might best converge and receive the greatest focus, and so it is not surprising that he would expand the metaphor in his description of the scholar: "A fine scholar may appear very silly to every one in

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[83] See *JMN* 4:323 "Journal A" 1834 and "Nature," *W* 1:50-1.

[84] *JMN* 6:31 "Blotting Book I" 1826. See also *JMN* 6:126, Encyclopedia, 1824-36, where Emerson repeats this statement, "Minds are lenses of different convexity. The rays of truth which penetrate one, fall on this <s> or that side of another."

succession of the audience whom he delights with this eloquence. He is a lens that has no power but at its focus: at any other distance it gives all blur & dislocation" (*JMN* 5:430). The connections Emerson draws between lenses, the mind, and the scholar reappear in a commentary he penned regarding Amos Bronson Alcott. He first praises the philosopher, writing:

> For every opinion or sentence of Alcott, a reason may be sought & found, not in his will or fancy, but in the necessity of nature itself, which has daguerred that fatal impression on his susceptible soul. He is as good as a lens or mirror, a beautiful susceptibility, every impression on which, is not to be reasoned against, or derided, but to be accounted for, &, until accounted for, registered as an (indisputable) addition to our catalogue of natural facts. (*JMN* 14:83)

However, Emerson finds faults in Alcott's thinking that he likens to an imperfect or misused lens:

> There are defects in the lens, & errors of refraction & position, &c. to be allowed for, and it needs one acquainted with the lens by frequent use, to make these allowances; but 'tis the best instrument I have ever met with. (*JMN* 14:83)

This passage not only demonstrates Emerson's familiarity with the manipulation of magnifying lenses, making explicit his knowledge of qualities like "refraction" and "position," but reinforces his confidence in employing the lens as a meaningful metaphor of the mind.

All of this is to establish that knowledge of microscopy was something Emerson consistently refined; it was not simply a passing interest for him. He not only referenced microscopical science regularly to illustrate various opinions (I have only cited a small selection), but he did so throughout his long career as he discussed a wide range of topics directly related to microscopy, from broader fields such as chemistry, anatomy, botany, and entomology, to specific subjects like germs, cells, lens making, and the different styles of magnifying instruments. This is to say that microscopical terms appearing in Emerson's works are not employed arbitrarily; rather, they carry intent that often reflects his opinions towards the science. And considering how Emerson was nothing if not optimistic regarding the powers of the poet and of the human mind, applying microscopical terminology in such a way as to advance and encourage his views on these subjects suggests a certain fondness he had for the science. These examples illustrate a parallel that Emerson regularly draws between scientific tools and the mind's transcendental connection with the divine laws of nature, which is not too different from John Winthrop, Jr.'s understanding of the spiritual services provided by the study of alchemy—that the purpose of scientific methods which make use of instruments like the microscope was ordained by God in order for Christians to attain a more comprehensive knowledge of God's universe, and thus better prepare for the second coming.[85] Emerson applies this idea—that our tools represent our minds and are essentially linked to nature—to the microscope throughout his journals and published works, indicating their valuable role in fostering a comprehensive engagement with the natural world: "Chemistry, Entomology, Conic Sections, Medicine, each science, each province of science will come to satisfy all demands" (*JMN* 8:260); "Hurra for the microscope!" (*JMN* 8:104).

Far more often, however, Emerson will contradict the value of the microscope than endorse it. In fact, the majority of the microscope's appearances in his published works and journals characterize it as a kind of foil, a superfluous plaything of the dilettante at best, and an insulting tool of anti-transcendental dissection at worst. He may have formed this negative opinion towards microscopy as a reaction to a threat he sensed in the tools employed by modernized science, which he considers in a series of later journal entries:

> I do not know that I should feel threatened or insulted if a chemist -should- take his protoplasm or mix his hydrogen, oxygen & carbon, & make an animalcule incontestably swimming & jumping before my eyes. I should -only feel- that it indicated that the day had arrived when the human race might be trusted with a new degree of power, & its immense responsibility. (*JMN* 16:232)

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[85] For more on John Winthrop, Jr.'s alchemic aspirations, see Walter W. Woodward, *Prospero's America: John Winthrop, Jr., Alchemy, and the Creation of New England Culture, 1606-1676*. Though by no means an alchemist, Emerson did see some value in the motivations of alchemy, especially as a kind of scientific method attentive to its "human side," which he expressed in "Beauty": "Alchemy which sought to transmute one element into another, to prolong life, to arm with power, —that was in the right direction. All our science lacks a human side (*W* 6:282). Moreover, in Journal Q, Emerson wrote, "God has opened this knowledge to us to correct our theology & educate the mind" and "I hope the time will come when there will be a telescope in every street" (*JMN* 2:24-5), suggesting further his interest in combining spirituality with science.

The chemist experimenting with various elements obviously uses the microscope to observe the effects on animalcules "swimming & jumping before [his] eyes," and Emerson sees this as an indication of the potential power that such instruments offer the human race, which may or may not be up to the challenge.[86] For Emerson, the threat is not only determined by the responsible handling of scientific discoveries, but in the very method of arriving at them. He is concerned that the hard sciences intentionally ignore the care with which the philosopher approaches such powerful phenomena, a feeling he believes is shared by the editors of *Die Atlantis*, a short lived German-American scientific journal which Emerson regularly read (his library contains most of the issues published 1856-7):

> I find a good sense in the German Atlantis, which thinks Astronomy overprized, which, at present, is a cold desart [*sic*] science, too dependent on the mechanic who grinds the lens, & too little on the philosopher. So of Chemistry & Geology[;] it finds few deeps in … them, no genial universal maxims. The little world of the heart is larger, richer, deeper, than the spaces of Astronomy, which take such a row of pompous ciphers to express. And when the same devotion shall be given to Ethics & jurisprudence, as now is given to Natural Science, we shall have ideas & insights & wisdom, instead of numbers & formulas. (*JMN* 13:55)[87]

Astronomy, chemistry, and geology were all influenced by improvements made in lens design which Emerson makes explicit in the above passage. The threat manifesting in the sciences that employ optical devices is further qualified, here, in that these sciences have become, for Emerson, too impersonal, too "dependent on the mechanic who grinds the lens," and as such neglects the democratic value he once saw in the consensus of the varying fields. By forgetting the human element, the "world of the heart," the mechanical scientist is unable to achieve universal maxims. Additionally, Emerson sees the threat

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[86] Emerson continues discussing the splendors and threats advanced by modern inventions, highlighting the steamboat, the railroad, the electric telegraph, the spectroscope, the sewing machine, etc., and speculating on the necessity of poetry to correlate men with these inventions. See *JMN* 16:242.

[87] *Die Atlantis*, later called *Die Atlantis: Eine Monatschrift für Wissenschaft, Politik, und Poesie*, was a scientific journal established by Christian Essellen. Essellen was a very well educated radical who fled his native Westphalia sometime in the early 1850s after involvement with a series of activities related to the "Forty-Eighters" political movements. He studied law at Freiburg, philosophy at Heidelberg, and medicine at Berlin before settling in Detroit, where he began the weekly publication of *Die Atlantis* in May, 1853. Essellen financed the journal out of his own pocket, and found it difficult to keep it afloat. He regularly moved to different cities seeking employment at established newspapers in order to continue funding the journal, which went in and out of publication until its final issue, printed December, 1858, in New York City. See Carl Heinz Knoche, *The German Immigrant Press in Milwaukee*.

advancing and potentially eclipsing branches of study more properly philosophical, namely "Ethics & jurisprudence," that he feels he must speak up for. Scientific apparatuses, especially instruments like the microscope that necessarily depend on the "mechanic who grinds the lens," come to represent Emerson's hesitations with certain branches of natural science; he uses them as a foil to define a mode of engagement with nature that ignores the philosophical and transcendental attitude concerning the role of the human heart.

While Emerson had at times likened the mind to a focusing lens, a metaphor he applied to the mind of the "fine scholar," he also uses the microscope to warn the scholar against becoming fearful, mediocre, or prone to dilettantism. As he puts it in "The American Scholar," the scholar must be brave, must face danger, and must never seek "peace by the diversion of his thoughts from politics or vexed questions, [by] hiding his head like an ostrich in the flowering bushes, peeping into microscopes, and turning rhymes, as a boy whistles to keep his courage up" (*W* 1:104). The phrase "peeping into microscopes" has a certain sarcastic nuance to it as he equates it with the ostrich and the boy whistling—the ostrich hiding his head and the boy whistling both appear silly, which Emerson parallels by using "peeping" instead of a more scholarly term like "inquire," "explore," or "inspect." But, Emerson here figures the microscopist as somehow fearful in his refusal to face dangerous questions by hiding his head from nature, and so positioning the microscopist between these images suggests Emerson's low opinion of the science. He regularly refers to the microscope in this sarcastic and condescending manner, characterizing it as a plaything of the dilettante in an 1834 journal entry—"The dilettante does not, to be sure, learn anything of botany by playing with this microscope" (*JMN* 4:297)—and listing them as "pretty presents" alongside "magnets," "little globes," and "inkstands," to give on holiday occasions, marking them more as toys than as serious instruments of philosophical or naturalistic investigation.[88]

[88] See *JMN* 6:221 "Encyclopedia" 1824-36 and *JMN* 11:138 "Journal TU" 1849. Another example of Emerson using the microscope to sarcastically insult inferior philosophy is found in Journal AZ (*JMN* 11:228). In February of 1850, Alcott hosted a series of "Conversations" at his home, where he and other scholars were to discuss the Times. A month prior, Emerson had lectured on the "Spirit of the Times," and had given a course of lectures called "On the Present Age" in the 1839-40 season (see *JMN* 7:338).

Just as often, he uses microscopical terminology to suggest a kind of overtly negative or superfluous type of criticism, such as when he describes English newspapers pushing a "relentless inquisition" that "turns the glare of this solar microscope on every malfaisance" (*W* 5:261), or in his speech, "The Assault upon Mr. Sumner," where he characterizes advocates of slavery as having "fastened their eyes like microscopes … on every act, word, manner and movement [of Sumner's], to find a flaw" (*W* 11:250). In a journal entry on the same topic, Emerson had written that "[i]f Sumner were pro-slavery, there would be no chemical analysis <& solar microscope> & magnifying glass needed to exhibit his foibles" (*JMN* 14:293). These passages suggest Emerson's opinion of the microscope as endorsing a mode of viewing that intentionally seeks flaws and imperfections. The line from "Compensation" cited above—"The world globes itself in a drop of dew"—continues "The microscope cannot find the animalcule which is less perfect for being little" (*W* 2:59), further implying that to view the world through the microscope is to hunt down imperfections; to look too closely at things is to dismiss universal maxims.

On the whole, then, Emerson thinks of microscopes as simply unnecessary, a notion that appears over and over again. In "Beauty," as before in the *Die Atlantis* entry, he uses the microscope as a foil to defend the profundity of the human heart: "The human heart concerns us more than the poring [*sic*] into microscopes, and is larger than can be measured by the pompous figures of the astronomer" (*W* 6:282). The microscope is unnecessary, here, because those things that the poet and the philosopher ought to be

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Emerson appears to be sarcastically criticizing Alcott and his peers, saying they think of "their own navels" as philosophically interesting, and that they use "eyeglass[es] & solar microscope[s]" to do so. This passage thus demonstrates Emerson's opinion of the microscope as a kind of toy for the arrogant and contradictory philosophers who have gathered at Alcott's home:

> It is not the least characteristic -sign- of the Times, that Alcott should have been able to collect such a good company of the best heads for two Monday Evenings, for the expressed purpose of discussing the Times. What was never done by human beings in another age, was done now; there they met to discuss their own breath, to speculate on their own navels, with eyeglass & solar microscope, and no man wondered at them. But these very men came in the cars by steam-ferry & locomotive to the meeting, & sympathized with engineers & Californians. Mad contradictions flavor all our dishes.
>
> Putnam, Whipple, Dewey, W.H. Channing, & I,—and I know not how many more,—are lecturing this winter on the *Spirit of the Times*! And now Carlyle's first pamphlet is "The Present Age." (*JMN* 11:228)

concerned with cannot be measured, an idea echoed in the following miscellaneous notebook entry: "there are some things so absolutely impossible as not to be found by the most curious & microscopic eye" (*JMN* 2:386). In "Country Life," Emerson presents the needlessness of microscopes when he writes, "Nature tells everything once. Our microscopes are not necessary. She shows every fact in large bodies somewhere" (*W* 12:160). He was significantly more sarcastic in the relevant journal entry to this passage, "[Microscopes] are a mechanical advantage for chamber philosophers[;] [nature] has magnified every thing somewhere. Each process, each function, each organ is disproportionately developed in some one individual. Go study it there, instead of wearing your eyes out in your 6 million magnifier" (*JMN* 4:268). Emerson begins to view the superfluous use of microscopes as an impediment to a more perfect and original engagement with the world, one that suppresses humankind's natural means of perception. This is the thought behind his statement in "Goethe; or, The Writer" that "Eyes are better on the whole than telescopes or microscopes" (*W* 4:274); in his declaration that "The eye is final; what it tells is the last stroke of nature" (*JMN* 14:166); in his argument that "Man is the husband of the world, and it makes no difference how far you extend nature astronomically, or microscopically, man follows, & is still the half, & the larger half" (*JMN* 14:184-5); and in his quoting from Karl August Varnhagen that "A microscopic history is not better than one seen with the natural unarmed eye" (*JMN* 16:180). The microscope is unnecessary and, worse still, its superfluousness threatens an undistorted and transcendental approach to nature. Emerson worries that the scholar may lose himself within the "unprofitable abysses of entomology" (*JMN* 7:111), and so speaking out against microscopical science becomes a pressing philosophical concern.[89]

And so the question becomes, why would Emerson appear so negatively critical of an instrument and a field of science with which he clearly appreciated? Reading through some of the more philosophically rich passages where Emerson makes use of microscopical knowledge might clarify the stakes that he no doubt saw in microscopy and offer a reason for his pessimistic opinion and ultimate rejection of the science.

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[89] See also the following journal entries where Emerson characterizes the microscope as superfluous and unnecessary: *JMN* 7:216-7; JMN 9:394; *JMN* 13:229; and *JMN* 13:430.

"Some men see microscopically: some see telescopically," Emerson wrote in an 1829 journal entry (*JMN* 3:150). From early on in his career, he drew a distinction between the microscope and the telescope, and he generalized each to represent particular modes of perception that further condition discernible and seemingly contradictory manners of relating to the world, ideologies or "world-views," one that magnifies and one that micrifies. Moreover, these modes of perception are not merely different, they are sometimes at war, as Emerson seems to note when he cryptically writes in a journal, "The war of the telescope & the Microscope[,] the mass & the particular" (*JMN* 4:286-7). However, these two instruments, as representations of oppositional world-views, are at war both with each other and with non-scientific manners of engaging with nature. That is, Emerson understands the two sciences, microscopy and telescopy, as encouraging oppositional modes of perception while both inform the "immense accumulation of scientific facts" that threaten to encumber the individual and draw one away from a just appreciation of the aggregate whole, a manner of viewing that Emerson locates in the poet and metaphysician.[90]

What does it mean, for Emerson, to view the world "microscopically," or, what are the stakes of promoting a world-view fostered by a microscopical mode of perception? In a series of passages written after his son Waldo's death of scarlet fever in 1842, a no doubt pivotal and influential moment on Emerson's thinking, an idea emerges that he connects with such microscopical vision. The idea is related to Emerson's recognition that, as he puts it in "Compensation," "Whilst thus the world will be whole, and refuses to be disparted, we seek to act partially, to sunder, to appropriate" (*W* 2:60-1). Again, Emerson has in mind the problem of entomology, the intentional dissecting or cutting out a part from the whole and wrongly privileging particularity to unity. He understands detachment as a pervasive and negative force, looming in all thought and

[90] Generally speaking, Emerson was less critical of telescopy and astronomy than he was of microscopy and its related sciences of entomology and chemistry. Though he does at times address the telescope sarcastically, seeing it as a similar tool informing scientific instrumentalism, he was more apt to praise it, going so far as to say "I hope the time will come when there will be a telescope in every street" (*JMN* 4:24-5). He had met Benjamin Peirce at the Cambridge Observatory in 1857 (see *JMN* 14:156), and had actually looked through a telescope at the Williamstown Observatory in 1865, where he witnessed the "Dumb-Bell nebula in the Fox & Goose constellation [Vulpecula]; the four double stars in Lyra; the double stars of Castor; [and] the 200 stars of the Pleiades" (see *JMN* 15:78).

every society, observed by parents watching their children grow, and illustrated by the infinitesimal generation of the chaotic and ferocious animalcules composing the lowest order of life:

> In vain, the wheels of tendency will not stop … The microscope observes a monad or wheel-insect among the infusories circulating in water. Presently a dot appears on the animal, which enlarges to a slit, and it becomes two perfect animals. The ever-proceeding detachment appears not less in all thought and in society. Children think they cannot live without their parents. But, long before they are aware of it, the black dot has appeared and the detachment taken place. ("Uses of Great Men," *W* 4:29-30)[91]

Locating precisely when in a young person's life the tendency to live in partiality begins is impossible, but that it will occur is inevitable; and the sign that it has occurred is the individual's acquisition of "microscopical vision." Emerson defines a "happy" period in which the "truly human force reaches its perfect extent, & has not yet gone over into fineness, and an excessive thought for surfaces," a period in which "the perceptive powers reach with delight their greatest strength & have not yet become microscopic" (*JMN* 9:324-5).[92] It is this period, prior to one's acclimation into the unnatural and civilized sphere of social life, that Emerson reveres and longs for, the period when one enjoys "an original relation to the universe" ("Nature," *W* 1:3), prior to the acceptance of worldly dissection, appropriation, and distinction. After acquiring microscopical vision, man becomes detached, and concerns himself with "fineness," or particular details, and "excessive thought for surfaces," rather than with the divine and universal laws that manifest through the particular. So the microscope comes to represent a mode of perception complicit with living in partiality, and thus names an imperfect manner of engaging with nature.

Seeing microscopically is thus one manner of seeing imperfectly, for, as Emerson puts it when discussing a proper approach to architecture,

> [t]he point of view is of more importance than the sharpness of sight. … The eye too near turns the fairest proportions of architecture or of sculpture into deformity … man who is finite must be set in the right place to see or the order will become confusion to his microscopic optics. (*JMN* 3:269)

[91] "wheel-insect" was originally written as "wheel animalcule."
[92] See also "Plato; or, The Philosopher," *W* 4:46-7.

To illustrate this insight, Emerson compares the points of view of one observing a battle from a higher vantage point with that of a soldier caught in the fray: “A person gets a better knowledge of the fortune & results of a battle from an eminence which commands the whole tho’ he see it thro’ much smoke and at a far distance than the soldier can get who fights hand to hand in some corner of the field” (*JMN* 3:269). It is precisely because the soldier is too near the phenomena perceived that he misses its aggregate qualities, its multiformity, its “fortune & results,” whereas the observer from distance may witness the whole, and thus comprehend its complete proportions. “Microscopic optics” simply confuses the viewer.

The same idea appears when Emerson speculates on the process of philosophical contemplation, comparing the organic tangents and diversions such thinking entails with the sailing of ships:

> Is any motion different? The curve line is not a curve but an infinite polygon. The voyage of the best ship is a zig zag line -on- a hundred tacks. This is only microscopic criticism. See the line from a sufficient distance & it straightens itself to the average tendency. (*JMN* 7:216-7)

“Microscopic criticism” again misses the “average tendency,” as its vision is distorted and flawed by too near a distance. A more perfect point of view is from afar, where the viewer recognizes the completed voyage as a whole, rather than its particular and individual movements. The imperfection fostered by microscopical vision is something Emerson thinks about when inspired by Waldo’s birth to write of the child’s “infinite beauty”:

> the father alone by position & by duty is led to look near enough to see. He looks with a microscope. But what is most beautiful is to see the babe & the mother together, the contrast of size makes the little nestler appear so *cunning*, & its tiny beseeching weakness is compensated so perfectly by the happy patronizing look of the mother, who is a sort of high reposing Providence toward it—that they make a perfect group. (*JMN* 5:234-5)

The father’s view of his child is less beautiful because he “looks with a microscope,” and thereby misses the more “perfect group” of mother and child together, a view that is fundamentally unavailable to microscopical focus.

We see in these selected examples not only confirmation of Emerson's use of the microscope to represent a type of vision that necessarily dismisses recognition of the whole in exchange for a distorted, ignorant, and imperfect dwelling within partiality, but also how pervasive this manner of employing the microscope was for him and how regularly he thought of it. The tension between particular and whole that Emerson defines through microscopical vision emphatically informs his reading of Goethe in *Representative Men*. Goethe's genius is found, in Emerson's estimation, precisely in his ability to dissolve "the past and the present ages, and their religions, politics and modes of thinking … into archetypes and ideas," to critically reflect on an "over-civilized time," one "plague[d] by microscopes," to "see connection where the multitude see fragments," and to "unite the detached atoms again by their own law," the law of cohesion manifested in nature (*W* 4:272-3, 289, 264). Goethe's poetry challenges "tabulation and dissection," and restores confidence that our "[e]yes are better on the whole than telescopes or microscopes" (*W* 4:274). However, though Goethe "has no aims less large than the conquest of universal nature, of universal truth" (W 4:284), he does not always deliver, a product (and sacrifice) of seeing too much, of trying to integrate too many particulars. Emerson articulates this character of Goethe's work with the following question:

> Was it that he knew too much, that his sight was microscopic and interfered with the just perspective, the seeing of the whole? He is fragmentary … he collects and sorts his observations from a hundred sides, and combines them into the body as fitly as he can. A great deal refuses to incorporate … and hence, notwithstanding the looseness of many of his works, we have volumes of detached paragraphs, aphorisms, *Xenien*. (*W* 4:287-8)

His praise of Goethe centers on the poet's natural tendency to transcend particularity; and his criticism is defined by Goethe's occasional frustrations to reach those universal truths and laws towards which all things strive. This passage displays Emerson's clearest qualification of "microscopical vision," namely, that it "interfere[s] with the just perspective, the seeing of the whole." Even in Goethe, detachment is not eradicated, but his willingness to see beyond the fragmentary vision of the multitude earns him Emerson's approval and admiration.

The dilemma Emerson has with the microscope is that he sees it as an instrument that necessarily divides, dissects, and disrupts the unity that is nature, that instead it dwells only with the particular and never returns its gaze back upon the whole.[93] Microscopical vision, then, is the mode of perception that encourages an ideology of partiality and fosters an unjust manner of engagement with nature. His celebration of Goethe serves as a call to the multitude to resist "seeing microscopically," and thereby to reform the mode of viewing generated by the microscope. While "seeing telescopically" is not a satisfactory substitution for "seeing microscopically," it is at least borne out of more properly transcendentalist motivations, for from this point of view "one brings the great & the infinite home to our eye" (*JMN* 3:150). His experience at the Williamstown Observatory inspired him to write, "Of all tools, an observatory is the most sublime" (*JMN* 14:79), indicating his admiration of the telescope. At its best, the telescope reveals our divine relationship with the celestial; it displays that, although we live in partiality, we are connected, by the very means of visual perception, to things sublime:

> What is so good in a college as an observatory? The sublime attaches to the door & to the first stair you ascend, that this is the road to the stars. Every fixture & instrument in the building … has a direct reference to the Milky-Way, the fixed stars, & the nebulae. & we leave Massachusetts & the Americas -& history -outside- at the door, when we came in. (*JMN* 15:79)

Unlike the microscope, the telescope has the power to transport the viewer to a position in which recognition of the whole is inevitable—we leave Massachusetts and America and all thoughts of regionality and locality behind, and find ourselves among the laws that order the universe.

What inspires users of the observatory, and what Goethe's poetry achieves, Emerson holds, is this proper positioning of the mind relative to a correlating mode of perception, one that highlights its interconnectivity with nature. And so Emerson's call to the sciences, especially the microscopical sciences like entomology and like chemistry,

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[93] In "Swedenborg; or, The Mystic," Emerson calls both Swammerdam and Leeuwenhoek, two of the first generation microscopists, "unrivalled dissectors" (*W* 4:104). Additionally, in an 1834 journal entry, he warns Swammerdam (or any microscopical scientist) against forgetting his natural, human, relation with the entomological objects he observes, and becoming "a mere insect hunter, & no whit more respectable than the nut-hatch or titmouse who are peeping & darting about after the same prey" (*JMN* 4:288-9).

which “takes to pieces, but does not construct” (“Beauty,” *W* 6:282), is to “integrate the particulars,” to democratically and consensually shape a mode of viewing that corresponds with the transcendentalist vision of the whole:

> Let the Mind of the <observer> … be in a natural, healthful, & progressive state[;] let him in the midst of his most minute dissection, not lose sight of the place & relations of the subject … Let it be a point as before. Integrate the particulars. (*JMN* 4:288-99)

The microscope, as an image of man’s detachment from nature, and the microscopical scientist, obsessed with particular details and surfaces, represents the unhappy culmination of the microscopical view, where divine and universal laws are exchanged for egotistical and detached individuality, and the refusal to integrate the particulars becomes manifest. It is the misappropriation of our gaze towards the particular that both defines the microscope and distorts our view of the Over-Soul. And this means of description, this use of the microscope, to disclose humankind’s tendency to dwell in partiality, is absolutely fitting, for the microscope cannot turn its gaze to the whole; it can only magnify surfaces, never essences. As such, it is an instrument that sides with the extreme pole of particularity and challenges acceptance of the whole. This is the impasse Emerson wishes to undo, or, to “transcend.”

Emerson’s Symbolism after the Microscope

Plato inhabits a kind of middle ground for Emerson; he is the philosopher who recognizes phenomena as the analogous representation of corresponding *noumena*, and positions himself between the realm of being and the realm of becoming, “between mind and matter” (“Nature,” *W* 1:33), between unity and partiality, between Asia—the “country of unity, of immovable institutions … delighting in abstractions”—and the “defining, result-loving, machine-making, surface-seeing” genius of Europe (“Plato; or, The Philosopher,” *W* 4:52-4). By traveling East, Plato “imbibed the idea of one Deity, in which all things are absorbed,” and upon returning West, reconceived philosophy by placing the “infinitude of the Asiatic soul” (“Plato; or, The Philosopher,” *W* 4:53) at the base of the European tendency towards details. From this position, Plato can name phenomenal things as manifestations of their spiritual accord, and becomes "the -articulate- speaker, who no longer needs a barbaric paint & tattoo & whooping, for he can define … he is the arrival of accuracy & intelligence. He is the unrivalled definer" (*JMN* 9:324-5). Proper definition comes from this middle space between partiality/division and unity/spirituality. Plato, the "unrivalled definer" who is "clothed with the powers of a poet" ("Plato; or, The Philosopher," *W* 4:43), takes on the poet's role of "Namer, or Language-maker, naming things sometimes after their appearance, sometimes after their essence ("The Poet," *W* 3:21), as he recognizes in the manifold appearances of things the manifestation of the single Deity, nature, the Over-Soul.

Emerson follows a Platonic line of thought when shaping his theory of symbolism. Considering just how prevalent the microscope was for Emerson, it comes as no surprise that it would likewise emerge in his thoughts on language. His commentary on Plato as the "articulate speaker," for example, appears in the same passage where he mourns the loss of "the truly human force" that dissolves once the youth has "gone over into fineness," once his "perceptive powers … become microscopic" (*JMN* 9:324-45). He employs microscopical vision as one extreme defining Plato's proper position as the middle-ground, the extreme represented by Europe before Plato's return from the East, with its obsession for surfaces and details, devoid of spiritual unity. That is, in order to define Plato as the "unrivalled definer," and to promote his own Platonic version of language, Emerson turns to the microscopical as a means to represent an extreme and flawed manner of viewing that would undoubtedly promote a flawed theory of language.

Microscopical knowledge likewise appears in one of his strongest statements on language as presented in "The Poet." He had worked out a materialist theory of language in "Nature," arguing that any word, when traced to its roots, "is found to be borrowed from some material appearance" (*W* 1:25). Nature provides us with the material from which we create language, and thus provides the origin of all words. And words, by referencing the things of nature, consequently denote spiritual truths. However, Emerson argues that the spiritual element of the sign, called into being by the poet's power to apply the metaphorical structure of nature and to name things with words, eventually dims and deadens; when our words obtain currency, when they become commonplace, we lose the sense of their lively poetic origin. Emerson famously expressed this insight in "The Poet" with the following passage:

> Language is fossil poetry. As the limestone of the continent consists of infinite masses of the shells of animalcules, so language is made up of images, or tropes, which now, in their secondary use, have long ceased to remind us of their poetic origin. (*W* 3:22)

Emerson thus articulates one of his most important philosophical claims through a simile made possible by the microscope, likening the composition of language to the composition of nature and specifying the dense limestone surface of the continent as itself composed of "infinite masses of the shells of animalcules." Like Plato, Emerson acknowledges, then ultimately overlooks, the partial components that constitute the aggregate whole: language consists of images and tropes as nature consists of all material things, from the smallest animalcule to nations of its most complex material expression, the human being. Language reveals its analogous nature: words are to things as things are to spirit; and the analogy Emerson employs to express this insight highlights the inhabitants of the microworld: "as man & his planet are analogous, so the same laws which are found in these run up into the <invisible world> … hereby we acquire the key to these dark, skulking hide & seek, blindman's play of Thoughts, namely, by the solar microscope of Analogy" (*JMN* 14:238-9).

Like Plato's theory of Forms, Emerson's theory of language is primarily one of correspondence: briefly put, language is a system consisting of symbols, metaphors, and allegories representing the "radical correspondence between visible things and human thoughts" ("Nature," *W* 1:29), between nature and mind, where signs perpetually renew their naturalistic-mimetic character.[94] Sensible things are material manifestations of

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[94] See Mutlu Konuk Blasing, "Essaying the Poet: Emerson's Poetic Theory and Practice." Emerson's theory of language is somewhat more optimistic than Plato's. In his essay, "Plato's Theory of Language," Moriss Henry Partee summarizes Plato's position:

> He argues generally that the worth of an artifact other than for its immediate use lies in its ability to stimulate harmony in the observer. Since words are already a physical imitation of reality, both poetic manipulation and critical study of language can only fix man's attention on a level inferior to reality itself. Other physical imitations, through their mathematical proportions, can express the necessary harmony. But in language ordinary human convention provides a necessary modification of the correspondence to nature. This inherent human element prevents language from being completely faithful to reality. Expressing only a partial truth, language is neither

spirit, and as such, are already symbolic; they are substitutes for the all-pervading Over-Soul that is relationally structured as language. He would likely agree with Socrates who thought, as Raphael Demos has it, that “there is a natural or inherent appropriateness about names, as if objects came into being with their names clinging to them like skin. This natural rightness of names consists in the fact that they are likenesses of their bearers, short of becoming duplicates of them” (595). Even if we cannot demonstrate the explicit correspondence between words and the spiritual facts they represent—though Emerson tries to when tracing concepts like “right” and “wrong” to their sensible “roots,” i.e. “straight” and “twisted” (“Nature,” *W* 1:25), or when he cites examples of images relative to their material origins, “as *howl* from *owl*, *ravenous* from *raven*, *rotation* from *wheel*, and so on to infinity” (*JMN* 8:160)—Emerson believes we can at least demonstrate the essentially symbolic structure of language and nature.[95] “The poet is he who can articulate [the world],” because he uses language according to its true metaphorical structure, employing facts as signs and “show[ing] us all things in their right series and procession” (“The Poet,” *W* 3:20-1). And though the poet is “the Namer, or Language-maker,” his language is already directed by the Over-Soul, the original source directing all symbolism and symbolic structure as it manifests itself in the objects available to the poet’s articulation: “[T]here is nothing lucky or capricious in these analogies” (“Nature,” *W* 1:27) that are used by the poet because they are formed by spirit.[96]

Though nature is ever changing, the mode through which we commune with it does not. That is, all things may be reduced to the structure of the symbol with a common referent—spirit. This theory of symbolism aligns with what Emerson sees as the fundamental tendency of the mind to reduce all things to a single law.[97] And this tendency, I argue, is nascent in Emerson’s privileging of one mode of viewing (the

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> beautiful nor trustworthy.…As an imitation, language can only reflect imperfectly a reality beyond itself. (114)

Emerson’s twist, I believe, would be to argue that because signs receive their being from nature itself, and because nature is already structured symbolically, than language, in its symbolic character, follows suit with rather than challenges, reality.

[95] See Jeffrey L. Duncan, “Words and the Word in Emerson.”

[96] Unless, of course, man himself is lucky or capricious. See Blasing 9.

[97] See Richard P. Adams, “Emerson and the Organic Metaphor.”

macroscopical) to other modes (the microscopical). One may rid symbols of ambiguity in Emerson's system because of their common origin in spirit; irony loses its rhetorical force because the Over-Soul levels all contradictions to the single law. When Melville describes Amasa Delano, the Yankee captain through whom the narrative of "Benito Cereno" is given, and who many think of as a representation of transcendentalist naïveté, as "a man of such native simplicity as to be incapable of satire or irony" (51), he has this aspect of Emerson's thought in mind. Though the microscope informs Emerson's theory of language—he was aware of the inhabitants of the microworld, animalcules, and attempted to integrate this knowledge into his picture of the symbolic nature of language—his theory of symbolism, as might be expected from his ultimate dismissal of "microscopical vision," undoubtedly endorses an idealistic and macroscopical worldview tending towards the totality. Emerson's symbolism, dependent on corresponding and analogous relations with the Over-Soul, is one that only works with a macroscopical view. Without the common referent of spirit, the theory falls apart. As such, symbols take on the function of reproducing a stabilized pattern of meaning corresponding to the Over-Soul, and thus cannot account for figures of speech like satire or irony that disrupt the agreements between referent and expression. So when the microscopical view does not fit, it must be folded into a larger, more abstract, and transcendentalist metaphysics, and thus leaves itself open to the kinds of challenges that microscopical vision provides.

For example, in a passage implying his understanding of microscopical vision, Emerson argues that a view directed towards totality, one gained by an intentional overlooking of the particular, is better than one directed towards individual components:

> The charming landscape which I saw this morning, is indubitably made up of some twenty or thirty farms. Miller owns this field, Locke that, and Manning the woodland beyond. But none of them owns the landscape. There is a property in the horizon which no man has but he whose eye can integrate all the parts, that is, the poet. This is the best part of these men's farms, yet to this their land-deeds give them no title. ("Nature," *W* 1:8)

Poetic thinking achieves its authority for Emerson precisely by taking a non-microscopical mode of viewing, one resistant to dissection and detachment. In terms of Emerson's "farmer's landscape" metaphor, the microscopical view is one that attends to the individual farms rather than the horizon, and, to analyze the metaphor further, would likely disclose how singularly different these farms are from one another, that the landscape itself tells us little about truth or beauty, and that by disregarding these differences, one simultaneously equalizes the unequal. The “landscape” view is one that regularizes the irregularity disclosed by the microscope, rendering it absolute, marking it as the mode of perception that best reveals the “force impelling [every creature] to ascend to a higher form” (“The Poet,” *W* 3:20), and thus aligns with his theory of symbolism. Symbols, for Emerson, as manifestations of Spirit directed by the Over-Soul, reproduce the Over-Soul rather than contradict it, and the macroscopical view encourages this reproduction to occur.

But while blurring the distinctions might make for a prettier picture, it does not make for a more truthful one. By displaying a chaotic microcosmos underlying the perceptually semblant—a chaos Emerson likely considered when describing animalcules as “ferocious” and “savage”—upon which the visible world uncomfortably rests, the microscope indicates how incomplete such totalizing modes of viewing actually are. From this passage, and from Emerson’s regular dismissal of the microscope, one can discern a transcendentalist mode of viewing informing an operative logic that privileges the whole over the particular despite the unsound ontology and the intentional dismissal of other points of view this entails.

I am not arguing that the microscopical view, because of its resistance to or disruption of totalizing modes of viewing, serves as a more ethical, or proper, or better mode of construing the natural world. Such a position would assume that the microscope displays a “truer” or “clearer” picture of the world than other views, which is certainly not the case. However, the “microscopical view,” as one that calls into question the placidity of the whole, of Emerson’s greater landscape, definitely challenges his metaphysics by questioning the status of the singular parts composing the whole and the consequences this status has on transcendentalist abstraction and on symbolic reproductions of hierarchical categorizations of the world. The manner of construing the world that the microscope made available—as a mode of engagement emphasizing the ontology of the part and the detail while temporarily suspending conceptions of the whole, undermining notions of homogeneous substance, displaying the illusions of uniformity and systems of classification, bringing new phenomena into being—encourages a number of questions directed at Emerson: What gets left out when one looks only at the aggregate? What is missing from place in this totality? Who determines the law to which the mind reduces all things? The microscope puts perception under scrutiny in a way that challenges transcendentalist logic by revealing how abstracted transcendentalism is from the material world and how far natural sight is from the brute facticity of things.

Chapter 2.

"Myopic minds, seeing microscopically": Peirce and the Microscopical Mind

"Modern science," writes Charles Sanders Peirce, "with its microscopes and telescopes, with its chemistry and electricity, and with its entirely new appliances of life, has put us into quite another world; almost as much so as if it had transported our race to another planet" (5.513). The microscope not only revealed those parts of the natural world previously undisclosed, but revealed the world itself as somehow different, "another world," a *terra subvisibilia*, to which previous metaphysical systems could no longer apply.

The Popular Rise of Microscopy

This new world was made possible by the advancements with achromatic lens systems at the turn of the century, which significantly reduced the problems of chromatic aberration and thus stimulated a resurgence of microscopical science. Groups of enthusiastic microscopists sprouted up throughout Europe and the United States, as did a market composed of optical instrument manufacturers that, in James Cassedy's words, "[was] able to exploit the new discovery relatively quickly" (77). The "Microscopical Society of London," founded in September of 1839, was most likely the first of these specialized societies.[98] Other societies included "The Bristol Microscopical Society," founded in 1843, and "The Quekett Microscopical Club," founded by John Thomas

[98] The "Microscopical Society of London" received a royal charter in 1866 and was renamed the "Royal Microscopical Society." Additionally, two letters contained in the Thomas Court Collection at the American Philosophical Society document the establishment of the "Microscopical Society of London," both addressed to Cornelius Varley. The first of these, written by George Moore, serves as an invitation to a large party held by Earl De Gray, for which De Gray is requesting the procurement of "two or three Microscopes for exhibition." The second letter is also an invitation to a party and is written by Edwin Quekett, the older brother of John Thomas Quekett who formed "The Quekett Microscopical Club" in June of 1865. Quekett writes to Varley describing an "idea that is afloat viz: the forming of a Society of Microscopists," which was enacted at Quekett's home later that year.

Quekett in June, 1865.[99] Microscope parties and exhibitions became regular events for the nineteenth century scientist, as a growing number of societies funded a growing interest in microscopy. Originally offering simple and informal meetings, where two or three microscopes might be displayed, these societies soon developed more extravagant functions, with formal invitations, programs, and catalogues of the microscopical items to be exhibited.[100] Besides merely demonstrating the increasing popularity of the microscope, the rise of these societies indicates an emergent community for the exchange of microscopical ideas. Gala events put on by these groups drew interest from numerous cooperative societies composed of members from across the spectrum of sciences. Additionally, these groups produced their own journals that aided in the dissemination of microscopical discoveries and developments in the optical apparatus.[101] It was by means of these societies and their publications that the science of minutia drew the attention and, ultimately, the respect from the scientific community at large.[102]

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[99] Other societies formed throughout Europe and the United States at this time include (in England): "The Old Change Microscopical Society" (1867); "The Croydon Microscopical Society" (1870); "The South London Microscopical and Natural History Club" (1871); "The Medical Microscopical Society of London" (1873); and "The Postal Microscopical Society" (1873); (in the U.S.): "The Leidy Microscopical Society" (1858); "The State Microscopical Society of Illinois" (1868); "The San Francisco Microscopical Society" (1872); "The Boston Microscopical Society" (1873); "The New York Microscopical Society" (1877); and "The American Microscopical Society," which grew out of the first National Microscopical Congress that had convened in 1878. I have yet to track down the many other microscope societies that had appeared simultaneously with those listed above from other European and American countries, but I think my point that the nineteenth century witnessed a surge in microscopical interest during this time as exemplified by the formation of these groups has been adequately evinced with this admittedly non-comprehensive list.

[100] The Old Change Microscopical Society, for example, held its second annual soirée in 1868 at the City Terminus Hotel. The program for this event, located in the Thomas Court Collection at the American Philosophical Society, includes a lengthy list of the instruments and samples that will be on display, objects like tongue of anthomyia (a genus of fly), brine shrimp and beetle parts, and an injected retina of a human eye. In addition to this exhibition catalogue, the program provides the names of the societies contributing objects for viewing; this occasion featured items furnished by the Fellows of the Royal Microscopical Society, Members of the Quekett Microscopical Club, and The North London Naturalists' Club.

[101] Early articles by John Quekett, published in *The Transactions of the Microscopical Society of London*, included titles like "On the Structure of the Ligament connecting the Valves of Conchiferous Mollusks," and "On the Intimate Structure of Bone, as composing the Skeleton in the four great Classes of Animals, viz., Mammals, Birds, Reptiles and Fishes." An article written by Joseph Bancroft Reade was published here as well, under the title "On Animals of the Chalk still found in a living state in the Stomachs of Oysters."

[102] While the kinds of articles produced tended to concern either descriptions of microscopical objects for *biological* consideration, where the author details the images of the minute and suggests interpretations for the functioning of newly recognized organic structures, or else on the history and apparatus of the microscope itself, biology was not the only science considered. Articles on polarized light, chemical

The journals of microscope groups provided another important service that aided the popular rise of microscopy in the mid-nineteenth century: the inside flaps and concluding pages offered open and convenient spaces for designers of microscopes and microscope accessories to advertise their latest products. Makers like Charles Coppok, R. & J. Beck, W. Emil Becker, W. Watson & Son's (the list goes on) advertised in journals published by the R.M.S. and others.[103] Catalogues, user guides, and other microscope related publications all included such advertisements, but, while the noticeable increase in advertising indicates the burgeoning market described by Cassedy above, the microscope was still generally considered an instrument of the specialist, and only available to a select few.

In America, where most scientific advances trailed behind those made in Europe, the microscope was not widely sought until around 1840. Only those who had both "the money to buy microscopes and the leisure to use them became, by their small number if nothing else, a very elite group in Jacksonian America" (Cassedy 78). "A good microscope," Cassedy continues, "even became a tangible status symbol in scientific circles" (78). The microscope did, of course, eventually outgrow its specialized status to reach a wider audience, and the appearance of a vast number of works on microscopy geared towards a lay audience, often taking up general introductory topics and written in non-specialized prose, leads one to believe that, at the very least, the seeds of a budding popular interest in the science had begun to sprout.

Though books on microscopy intended for the amateur were definitely published

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crystallizations of sulfates, and color theories complemented the work of biologists, providing a more comprehensive understanding of the influence and significance of microscopical analysis. Nearly every article includes supplementary sketches of the images discussed and the objects examined.

[103] An 1865 reprint of Thomas Bolton's essay, "Hints on the Preservation of Living Objects and their Examination under the Microscope," which had originally appeared in *English Mechanic and World of Science*, contains an advertisement for a "specimen subscription" offered by Bolton's "Microscopist's and Naturalist's Studio." The advertisement promises to send a selection of twenty-six tubes containing living forms of protozoa, entomostracan, rotifera, etc. to subscribers over the course of six months. Appended with the advertisement is a lengthy testimonial from E. Ray Lankester, zoologist and fellow Royal Society member, who describes the process, and urges "every naturalist within a day's post of Birmingham, [to] subscribe a guinea to Mr. Bolton's agency, and ensure a weekly receipt of one of his most interesting tubes." A similar advertisement appears on the front page of an instruction pamphlet written for the Boy's International Compound Microscope. For sale here is a cabinet consisting of thirty-six mounted objects, such as starch, down, feathers, hair, fish scales, insects' wings, legs, and tongues.

prior to the 1830s, the science was still wanting of widespread, non-exclusive prevalence into the 1850s.[104] At least this is what Jabez Hogg's preface to his history of the microscope, what he calls a "familiar introduction" to the instrument, might suggest. Here, Hogg describes the microscope's popular status, writing,

> It had been to [the author] for some time a subject of regret, that one of the most useful and fascinating of studies—the study that belongs to the domain of microscopic observation—should be, if not wholly neglected, at best but coldly and indifferently appreciated, by the great mass of the general public; and he formed a strong opinion, that this apathy and inattention were mainly attributable to the want of some concise, yet sufficiently comprehensive, *popular* account of the Microscope, both as regards the management and manipulation of the instrument, and the varied wonders and hidden realms of beauty that are disclosed and developed by its aid. (*v*)

Hogg continues:

> [The author] saw around him valuable, erudite, and splendid volumes; which, however, being chiefly destined for circulation amongst a special class of readers, were necessarily, from the nature of their contents and the style of their production, published at a price that renders them practically unattainable by the great bulk of the public. They constitute careful and beautiful contributions to the purposes of science; but they cannot adequately serve to bring the value and charm of microscopic studies home, so to speak, to the firesides of the people. (*v*)

The author's endeavor to produce an affordable and popular guide to microscopy was successful, as the work was reprinted in at least fifteen editions between 1851 and 1898. It is difficult to discern exactly how influential Hogg's "popular account" was on the

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[104] For example, Henry Baker's *The Microscope Made Easy* was published in 1742, George Adams's *Micrographia Illustrata* in 1746, and Sir Richard Phillips's *The Wonders of the Microscope*, the lengthy title of which includes the phrase, "adapted to the understanding of young persons," was published in 1811. In fact, numerous non-technical works on microscopy began to appear in the 1740s, what Jutta Schickore refers to as "popular books" written for an informal, domestic audience and feeding a sphere of eighteenth century scientific enterprises that historians have termed "polite science," for the leisurely pursuit of scientific studies undertaken in the home for entertainment purposes and discussions in "polite society." Catherine Wilson argues that the appearance of these kinds of works reflects the resignation of microscopists to the impossibility of advancing the field, so that, because "all the important microscopical discoveries have already been made … the best an author can do is to assist the home experimenter in reproducing them" (227), and thus accounts for the "decline" and "stagnation" of microscopy until its early nineteenth century revival. Jutta Schickore disagrees, arguing that with the excavation of a "substantial body of facts and ideas that were established in the eighteenth century," historians have "begun to dispute the alleged 'decline' of microscopy" and have "reevaluated the overall impact on the life sciences of this new knowledge" (17). I argue below that, if eighteenth century microscopists felt that no further advancement could be made with microscopy, it was primarily due to the unavailability of a semiological system that could account for the discoveries.

generalized appreciation of microscopy by the public, but what can be determined is that from the time of its initial publication on, production of books on the subject increased significantly. Titles like: Louis Lane Clarke's *The Microscope; Being a Popular Description of the most Instructive and Beautiful Objects for Exhibition*; Edwin Lankaster's *Half-Hours with the Microscope; A Popular Guide to the Use of the Microscope as a Means of Amusement and Instruction*; Edward Schäfer's *A Course of Practical Histology; Being an Introduction to the Use of the Microscope*; John Phin's *Practical Hints on the Selection and Use of the Microscope, Intended for Beginners*; Thomas White's *The Microscope and How to Use it: A Handbook for Beginners*; and Lewis Wright's *A Popular Handbook to the Microscope*, and many others, became available to a non-specialized public interested in microscopy, typically for entertainment purposes. Children's and student's guides, instruction manuals, and catalogues were widely issued, as were illustrated monthly magazines.[105]

Since the advent of the achromatic lens, interest in the microscope steadily increased, first amongst specialized groups that emerged at the turn of the century and then with a broader public through advertising campaigns, public exhibitions, and introductory publications. Throughout the 1840s, American naturalists eagerly expanded their knowledge of microscopical methods; and by the 1850s the instrument had been established as a common tool of nearly all scientific disciplines. And at this time,

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[105] Even though the instrument was generally unavailable to the public until the latter part of the nineteenth century, the term "microscope" was already in common use, carrying connotations that seem at odds with the scientists and authors that so enthusiastically endorsed it. Those interested in the microscope saw it as a means of disclosing the wonders of subvisibilia, opening new avenues for scientific discovery that might provide a more comprehensive understanding of the natural world. But popular opinion did not always share this sense of exploration. A short lived newspaper from Louisville, KY provides an interesting example of when the term and the device part ways. Dr. T. H. Roberts had started publication of his paper, *The Microscope*, in Louisville in 1824, the population of which grew rapidly during this period due to its placement on the banks of the Ohio River. In September of that year, after publishing a few too many articles that probed too deeply, an angry mob drove Roberts out of the city. He ended up just across the river in the small town of New Albany, IN, and continued the paper under the name *The Microscope and General Advertiser*. Despite his previous ordeal in Kentucky, Roberts continued to publish suggestive stories testing the limits of propriety, thus making *The Microscope and General Advertiser* one of the first scandal sheets published anywhere.

The microscope does not merely mean to look closely at something, but to look "too closely" at something. Its use in Roberts's paper characterizes the term as one indicating the invasion of privacy and disruption of placid surface. Some scientists, like some journalists, are digging too deeply; some things are meant to stay invisible, to remain unseen and unsaid. Some things are not to be questioned.

Emerson was nearly two decades into his philosophical career. As demonstrated above, Emerson greeted the knowledge conveyed by the microscope with ambivalence; his general interest in natural history motivated his becoming familiar with the instrument, and yet he saw in the mode of perception it generates a nascent contradiction of his transcendentalist maxim to privilege the whole over the particular. This ambivalence was coupled with the instrument's novelty, Emerson having witnessed firsthand its increasing prevalence amongst the scientists of the mid to late nineteenth century.[106]

By the time Charles Sanders Peirce published his first essay "The Chemical Theory of Interpenetration" (1863)—part scientific exposé on the principles of Atomic Theory, part quantification of the *a priori* metaphysical conditions of force, change, and motion—the microscope had become a fixture of scientific inquiry, indicated by the essay's illustrations of exceedingly minute atomic weights.[107] Despite their overlapping careers, interests, and mutual and familial acquaintances—Emerson and Charles's father Benjamin Peirce both were original members of the Saturday Club—the two appear to have worked in different ages. On the one hand, Emerson foresaw the coming of the age defined by microscopical vision, an age where measurement "became the only experimental thing to do" (Hacking 5), and considered the nascent perceptual and philosophical impasses that would soon emerge. Peirce, on the other hand, was born into an age already shaped by the microscope, one that emphasized encountering the world in

[106] Thoreau, on the other hand, was as enthusiastic about his microscope as anyone, and this enthusiasm was not lost on Emerson. Emerson regularly mentions in his journals how Thoreau would bring his pocket microscope along with them on their walks about Sawmill Brook, and how he would wade into the pools to examine plant life and water samples. In his eulogy of Thoreau collected in volume X of *The Complete Works, Lectures and Biographical Sketches*, Emerson describes Thoreau's "armor," writing, "Under his arm he carried an old music-book to press plants; in his pocket, his diary and pencil, a spy-glass for birds, microscope, jack-knife and twine" (*W* 10:469). Much like his celebration of Goethe's superior perception, Thoreau too had a "power of observation [that] seemed to indicate additional senses. He saw as with a microscope, heard as with ear-trumpet, and his memory was a photographic register of all he saw and heard" (*W* 10:471). Emerson's recognition of Thoreau's enthusiasm for microscopy indicates, in my estimation, the arrival of a new age in which microscopical vision becomes commonplace, an age he observed come into being and into which Peirce was born. Emerson scholar Michael Jonick argues that, throughout the 1850s until his death in 1862, Thoreau "increasingly turned away from an 'ideal' picture of nature towards encountering nature in its particularity, a particularity to which [Emerson's] *Journals* and later natural history essays bear witness." I have argued that the microscope encourages a mode of perception that emphasizes particularity, and thus parallels Jonik's argument regarding Emerson's late thoughts concerning the "natural history of the intellect."

[107] See Max H. Fisch's Introduction to *Writings of Charles S. Peirce: A Chronological Edition, vol. 1, 1857-1866,* and Peirce, "The Chemical Theory of Interpenetration" in *Writings 1*: 95-100.

its particularity against the earlier idealist and transcendentalist conceptions of nature as a whole. "The changes are inevitable;" Emerson wrote in 1866, "the new age cannot see with the eyes of the last" ("Character," *W* 10:108), a sentiment that, with the rise of the microscope, lends itself to a more literal interpretation than perhaps Emerson intended.[108]

Through both his intense studies of chemistry and biology, as well as his time employed by the U.S. Coast Survey, Peirce undoubtedly became familiar with microscopes and other optical instruments. He used them in countless experiments, and he writes about them with definite authority in his data and survey reports, as well as in essays not directly concerned with his laboratory findings.[109] Not surprisingly, this

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[108] Not only was Peirce born into an age where the microscope was prevalent, he was also born into a family deeply invested in the methods of science. His father Benjamin was the leading mathematician of his day, onetime president of the American Association for the Advancement of Science in 1853-4, and a chief authority on astronomy. Emerson was acquainted with Benjamin Peirce, and even visited him at the Cambridge Observatory in 1857 an experienced he documented in his journals (see *JMN* 14: 156). His uncle Charles Henry Peirce was a practicing physician who later became professor of chemistry in the Lawrence Scientific School at Harvard. When Charles Henry died, Charles Sanders inherited his chemical and medical library, which biographers believe had significantly influenced his early interest in chemistry and his later scientific aspirations (see Brent 30 and 47-8). His older brother James taught mathematics at Harvard and his younger brother Benjamin, who graduated from Harvard in 1865, studied engineering at the Paris School of Mines and later at the Lawrence Scientific School (see Brent 29 and *Writings 1* xvi). The Peirces were among the social, political, and intellectual elite, forming connections with Harvard's top scientists and intellectuals. While still young, Charles Sanders took up a "decided preference for chemistry" (*Writings* xix) which he maintained throughout his career at Harvard. A precocious child, Peirce composed a "History of Chemistry" while only eleven years old, a work which, unfortunately, has not been found (*Writings 1* xviii-xx). He would eventually earn a *summa cum laude* Bachelor of Science in chemistry from the Lawrence Scientific School in 1863. By this time, he had been intermittently employed as a research scientist at the United States Coast and Geodetic Survey for nearly five years, beginning with an appointment from his father's friend Alexander Dallas Bache in 1859, and later as a member of a field party in Machias, Maine and around the Mississippi delta (see Brent 54, and *Writings 1* xix). By this time he had been intermittently employed as a research scientist at the United States Coast and Geodetic Survey for nearly five years. He would hold numerous positions attached to the federal agency for the next thirty years.

[109] Confirmation of Peirce's familiarity with the use of microscopes appears in numerous Coast Survey Reports and essays collected in *Writings of Charles S. Peirce: A Chronological Edition*. See, for example, the Report titled "On the Use of the Noddy for Measuring the Amplitude of Swaying in a Pendulum Support" (*Writings 5* 262-74), where Peirce describes the microscopical attachments to the "Noddy," an instrument invented by the English clockmaker Thomas Hardy, used to measure amplitude of oscillatory swaying:

> At the top of the staff is fixed a small oblong frame carrying a glass scale running in the direction of the oscillatory motion. The scale is 10 centimeters from the attachment of the staff to the reed. A pillar attached to the bed-plate, with its axis in the vertical plane of the reed, carries a horizontal microscope directed toward the scale on the noddy, which is illuminated from an adjustable reflector behind. The microscope is focused with a ratchet; it is furnished with a draw-tube, and carries in the focus of the eye-piece a horizontal scale on glass, each division of which is equivalent to about $0.^{mm}03$ in the focus of the objective as ordinarily used. (263)

characteristic of his training characterizes the usual distinctions drawn between his and Emerson's philosophical methodologies. Whereas Emerson generally turns to poetry to cultivate a whimsical and idealist philosophy, recognizably sagacious, speculative, and metaphysical, Peirce approaches philosophical questions with a meticulous eye for detail that privileges logical clarity of expression. One might characterize Peirce's method as embracing those qualities for which Emerson dismissed the microscope, as one that discerns, rather than surrenders to, the myriad properties of metaphysical propositions by detaching them from their obscurantist disorder, their "rich mud of conceptions," as he puts it in "How to Make Our Ideas Clear" (5.393). Peirce takes apart the operative conceptions of metaphysics; he dissects them and describes them "as they appear under a mental microscope" (5.394).

Their respective methodologies might thus be characterized as representing resistance to (on Emerson's part) or acceptance of (on Peirce's) a mode of thinking construed by the microscope. Emerson's chief disagreement with the microscope was that it fostered a view of the world resistant to contemplation of the whole. Another way of articulating his complaint is to say that the microscope is irredeemably *myopic*; the view it offers is unable to see anything beyond the objects immediately beneath its lens—it is myopia instrumentalized. Peirce's age is one that, for Emerson, would suffer from myopia as Peirce, seeing with the "eyes of his age," develops a philosophical orientation indicative of microscopical vision, one that values the tool not only for its use in the laboratory, but also as a suitable figure for his preferred approach to questions both physical and metaphysical: the scrutiny of his "logical microscope" (7.368).

And so, following the structure of my reading of Emerson, my reading of Peirce involves an examination of how he uses microscopical knowledge to construct his philosophical positions as well as how these positions are expressed through the use of the instrument. That is, the microscope not only construes the world, but opens up a

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Here, Peirce exhibits authoritative knowledge of the microscope's components, assembly, and functionality. For similar examples of Peirce detailing his use of microscopes, see: "Measurements of Gravity at Initial Stations in America and Europe" (*Writings 4* 79-144): 86; "Report on Gravity at the Smithsonian, Ann Arbor, Madison, and Cornell" (*Writings 6* 275-353): 299; "General Instructions for Observing Oscillating Pendulums" (*Writings 6* 459-61): 460; and "Man's Glassy Essence" (*Writings 8* 165-83): 174.

means of expressing it, making significant the theories of expression that correspond to its mode of perception. More specifically, just as the microscope provides a way to read Emerson's symbolism, it also provides a way to read Peirce's semiotic. The microscope discloses innumerable representations of an object through innumerable levels of magnification that are manipulated and halted only by the rules or intentions of the viewer. It sees only surface, and thus reveals no qualifying thing, mind, or spirit existing behind appearances; it emphasizes an endless chain of perspectives that I will argue informed Peirce's metonymic semiotic, signs signifying other signs, a system irreducible to a positive common referent.

"If there is any period one would desire to be born in," Emerson asks in "The American Scholar," "is it not the age of Revolution; when the old and the new stand side by side, and admit of being compared?" (*W* 1:110). The microscope, along with the newly cultivated practice of precise experimental measurement, expedited the deterioration of axiomatic thinking that defined Emerson's age. Peirce's thinking has everything to do with this change in perception, and his reconsiderations of the merits of metaphysics, measurement, science and signs have everything to do with the production of microscopical knowledge.

Observation

Chapter one brought to the surface a number of troubling questions, notably the tension between microscopical vision and dissection, entomology, language, the dialectic of whole and particular, the affinity between the mind and nature, and the role of perception in experience, judgment, and symbolism. In short, the microscope displayed a type of vision that Emerson links with a mode of worldly engagement, an existentialist approach to science, philosophy, and instruments of magnification. Our use of instruments, Emerson claims, speaks to an ethical outlook that ignores the interconnectivity amongst people.

The philosophical confrontations defining Emerson's attitudes towards microscopy appear again in Peirce's works, which also display a pronounced existentialist tendency representative of a set of positions reducible to a basic manner of engagement with the world.[110] On the one hand, Emerson, as is well known, endorses the poet as representing the ideal mode or method—through embodying the attitude of the poet one may best correlate one's mind with the mind of nature. Peirce, on the other hand, replaces the poet, as well as the philosopher, with what he sees as their modern avatar, the scientist.[111] In many ways, Peirce's employment of the microscope displays his thought as a perfect contradiction to Emerson. But they are by no means absolutely opposed. They share, for example, the position that the mind and the world naturally agree, that there exists a realistic and non-arbitrary correspondence between thought and world.[112] Peirce's scientist is like Emerson's poet in that both take on particular attitudes

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[110] *The Peirce Edition Project*, located at Indian University/Purdue University Indianapolis, is currently undertaking the tremendously difficult task of editing and organizing Peirce's writings. Much of his work exists only in manuscript form, and many of his papers, which have been at Harvard since 1915, are mixed and unordered. Their project, to produce a chronologically arranged critical edition of the papers, what will no doubt become the standard source of Peirce studies, has thus far completed seven of a projected thirty volumes. The works, titled *Writings of Charles S. Peirce: A Chronological Edition*, will likely replace the earlier editions known as *The Collected Papers of Charles Sanders Peirce*, a thematically organized collection in eight volumes that span Peirce's career. Due to the incomplete nature of the *Writings*, I have been forced to rely on the *Collected Papers* as my primary resource. I do believe that the conclusions I draw regarding Peirce's connection with microscopical epistemology and its influence on his general philosophical positions will only be further confirmed when the *Writings* are completed.

[111] These terms—Poet, Philosopher, and Scientist—were somewhat less distinguishable for Peirce as they are for readers today and much less so for Emerson, as detailed in chapter one. I am not arguing that Peirce saw no distinction between poetry and science, or philosophy, physics, chemistry, etc.; indeed, the classification of these disciplines presents a core aspect of his prolific contribution to turn of the century science. But, following from Aristotle, Peirce tends to fold each field into a general epistemological project of classification wherein poetry—thought of as one possible method of critique amongst several evolved options—speaks to a larger ethos defining the scientist, as the one whose work consists in "diligent inquiry into truth for truth's sake, without any sort of axe to grind, nor for the sake of the delight of contemplating it, but from an impulse to penetrate into the reason of things" (1.44).

[112] A consequence of this position, for both Peirce and Emerson, is that a fundamental humanism operates at the core of intellectual inquiry. All philosophical or scientific investigations are borne out of a similar humanist ground. "We must not begin by talking of pure ideas," Peirce write in his review of Josiah Royce, "but must begin with men and their conversation" (8.112).
Moreover, in chapter five of *Philosophy of Mind*, "Telepathy and Perception," Peirce offers a description of the scientist that I think ought to be read as a humanistic statement:

> There are two qualifications which every true man of science possesses, and which, if a man possesses them, he is sure to develop into a scientific man in the course of time, if he ought not fairly to be called one already. First, the dominant passion of his whole soul must be to find out the truth in some department, regardless of what the color of that truth may be. Secondly, he must have a natural gift for reasoning, for severely critical thought. Perhaps a man who had drunk of the fountain of perpetual youth need not, at the outset of his career, possess either of those qualifications: he would infallibly become a man of science at last, because the incessant action of

or ways of viewing the world that lead to methodologies simultaneously unique and shared. For Peirce, the scientist is characterized by an unrelenting drive for truth devoid of ulterior motivations, a willingness to refute testable hypotheses instead of seeking confirmation, an acceptance of error as an invitation to advance the intellect, and the keenness to reform—and ultimately wipe away—metaphysics. The scientific life, for Peirce, is one fostered by *hope*, especially the hope that, as Emerson would agree, "there is sufficient affinity between the reasoner's mind and nature's to render guessing not altogether hopeless" (1.121).[113]

> experience would ultimately produce those two qualities in him. For we see that, in a measure, that effect has been produced in the course of history upon civilized man at large. (7.605)

Given enough time, all people would likely become "scientists," for, as Peirce has it, all people commonly desire truth and possess the power of reasoning.

For Peirce's notion of the true scientific attitude devoid of ulterior motives, see the following passages from volume I, Principles of Philosophy, book I, *General Historical Orientation*, chapter two, "Lessons from the History of Science":

> If we are to define science … in the sense of characterizing it as a living historic entity, we must conceive it as that about which such men as I have described busy themselves. As such, it does not consist so much in *knowing*, nor even in 'organized knowledge,' as it does in diligent inquiry into truth for truth's sake, without any sort of axe to grind, nor for the sake of the delight of contemplating it, but from the impulse to penetrate into the reason of things … But if a man occupies himself with investigating the truth of some question for some ulterior purpose, such as to make money, or to amend his life, or to benefit his fellows, he may be ever so much better than a scientific man, if you will—to discuss that would be aside from the question—but he is not a scientific man. (1.44-5)

On scientific propositions, as opposed to religious or metaphysical, as offered only to be refuted, see volume VI, Scientific Metaphysics, book I, *Ontology and Cosmology*, chapter eight, "Objective Logic":

> Religion is a practical matter. Its beliefs are formulae you will go upon. But a scientific proposition is merely something you take up provisionally as being the proper hypothesis to try first and endeavor to refute. (6.216)

And, on Peirce's suggestion that the successful scientist ought to reform his metaphysics, see volume VII, Science and Philosophy, book II, *Scientific Method*, chapter one, "Scientific Method," especially sections 1, "Science," and 3, "Scientific Method":

> Science is to mean for us a mode of life whose single animating purpose is to find out the real truth, which pursues this purpose by a well-considered method … (7.54)
>
> Scientific Method: The general method of successful scientific research. The following are some of its characteristics … The third step should be to reform his metaphysics, if the question is a broad one. Perhaps he thinks he has no metaphysics, and does not wish to have any. That will be a sure sign that he is badly handicapped with metaphysics of the crudest quality. The only way to disburden himself of it is to direct his attention to it. But he cannot reduce himself to anything like absolute scepticism [*sic*] in metaphysics without arresting his work. (7.79-82)

[113] Science is equally informed by the imagination of the scientist. After illustrating the common mistake that scientists only think of propositions that are "extremely probable," Peirce adds, "On the contrary, [the scientist] entertains hypotheses which are almost wildly incredible, and treats them with respect for the time being" (1.120). Peirce continues,

However, an additional characteristic that Peirce applies to the scientist is one with which Emerson could not agree. The scientist not only puts faith in instruments of observation like the microscope, but takes on a microscopical way of viewing: “I suppose we scientific specialists, technical sharps, connoisseurs, travelers, scholars,” Peirce surmises, “are myopic minds, seeing microscopically” (6.561). Peirce faults metaphysicians, like Emerson, who take on a presbyopic or macroscopical mode of vision as a chief hurdle blocking the way of inquiry. He describes such presbyopic minds as “fogies” and “average board-members,” as men “whom one believes to be very wise, but whom one perceives to be very ignorant” (6.561).[114] It is the myopic and microscopical mind of the scientist that Peirce charges with the responsibility of advancing philosophy, of bringing philosophy to terms with a modern world replete with novel instruments of observation.

Unsatisfied with the incomprehensible metaphysicians, those philosophers “bred in theological seminaries, whose ruling impulse is to teach what they hold to be infallibly true” (1.4), with their “moonshine demonstrations” and their pretend establishment of foregone conclusions, Peirce sought to discern the constructs of experience under a new categorical framework, to update the Aristotelian foundations of a solid philosophical edifice, and to reclaim the universal categories from their Kantian ownership.[115] He sees that the long neglect of exact logic has led philosophy, and especially metaphysics, to a “disgraceful state,” one “entirely unworthy of the … intellectual development of our age” (1.15).[116] To “rescue” philosophy from its deplorable state meant, for Peirce, to “bring it

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> Why does he do this? Simply because any scientific proposition whatever is always liable to be refuted and dropped at short notice. A hypothesis is something which looks as if it might be true and were true, and which is capable of verification or refutation by comparison with facts. The best hypothesis … is the one which can be the most readily refuted if it is false. (“Lessons from the History of Science,” 1.120)

In addition to the importance of imagination to the conception of science as a “mode of life,” one that is borne out of careful and creative guesswork, Peirce suggests that to guess at all already implies a non-arbitrary correspondence between mind and nature. He thus advances the insight that science depends on the hope that mind and nature correspond, and adds that any success attributed to the discipline assumes the existence of this fundamental affinity. See endnote 45 below for the relevant passage.

[114] See footnote 51 below.

[115] See especially Peirce’s preface to volume I, Principles of Philosophy (1.1, 1.4, and 1.7) and section 7 of chapter two, “A Detailed Classification of the Sciences” (1.235).

[116] See also “Notes on Scientific Philosophy,” where Peirce writes,

to a condition like that of the natural sciences," where investigators emphasize consensus over introspection, where they "coöperate" and "stand upon one another's shoulders" (5.413).[117] His project to "make a philosophy like that of Aristotle" (1.1) demanded that

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> It is true that philosophy is in a lamentably crude condition at present; that very little is really established about it; while most philosophers set up a pretension of knowing all there is to know—a pretension calculated to disgust anybody who is at home in any real science. (1.128)

Though philosophy is in dire need of resuscitation, Peirce sees hope that science might revive it:

> But all we have to do is to turn our backs upon all such truly vicious conduct, and we shall find ourselves enjoying the advantages of having an almost virgin soil to till, where a given amount of really scientific work will bring in an extraordinary harvest, and that a harvest of very fundamental truth of exceptional value from every point of view. (1.128)

[117] Just as science "can only rest directly upon the theory of logic" (2.121), the scientist, as opposed to the metaphysician, must rest upon an agreed notion of consensus. Metaphysicians, not confined to consensus, consequently promote a conception of truth reducible to introspection and individuality, which, Peirce argues, is unverifiable, untrustworthy, and illogical. He draws the distinction in an early lecture on realism and nominalism, when he writes:

> [F]or in science a question is not regarded as settled or its solution as certain until all intelligent and informed doubt has ceased and all competent persons have come to a catholic agreement, whereas fifty metaphysicians each holding opinions that no one of the other forty-nine can admit, will nevertheless severally regard their fifty opposite opinions as more certain than that the sun will rise tomorrow. This is to have what seems an absurd disregard for others' opinions; the man of science attaches a positive value to the opinion of every man as competent as himself so that he cannot but have a doubt of a conclusion which he would adopt were it not that a competent man opposes it. (1.32)

Dependent upon consensus, the scientist must regularly critique his methods with rigor. And this regular self-criticism is precisely what distinguishes the scientific method as superior to other "methods of fixing belief." After defining these other methods—namely, the method of tenacity, the method of authority, and the *a priori* method of metaphysics—and criticizing how each method fails to "present any distinction of a right and a wrong way," that is, of reflecting back upon the method itself, Peirce concludes:

> But with the scientific method the case is different. I may start with known and observed facts to proceed to the unknown; and yet the rules which I follow in doing so may not be such as investigation would approve. The test of whether I am truly following the method is not an immediate appeal to my feelings and purposes, but, on the contrary, itself involves the application of the method. (5.385)

The scientist's recognition that she actually applies a method is part and parcel of the method itself. She does not appeal to "feelings and purposes" in order to test her right application of the method, but rather the method puts itself to the test. Applying the scientific method always involves this kind of self, or meta, criticism; it is built from out of it. Only a method that necessarily turns on itself could adequately account for that most basic of human tendencies, or laws, summarized in the familiar adage: *Errare est humanum* (6.86). Logic thus presents a way of thinking and engaging with the world that the scientific method promotes; one that highlights self-criticism and consensus, and one that considers all those questions to which Peirce routinely returned, such as the positivity of chance, the spontaneity of nature, the continuity of change, and the swerving of phenomena from law. "Try to verify any law of nature," Peirce challenges, "and you will find that the more precise your observations, the more certain they will be to show irregular departures from the law" (6.46).

As self-contained and devoid of ulterior motives, science, in Peirce's estimation, marks a way of knowing that is necessarily non-ethical. Modern science has been justly criticized on these grounds, particularly in its complicit roles in historically unethical social and political programs. I am not endorsing science over other ways of knowing, but merely working with Peirce's conception to see how important instruments of observation are to a series of foundational philosophical positions regarding metaphysics, he reconsider not only the application of reasoning, but the methods of reasoning itself. To "penetrate into the reason of things" (1.44) means to discern the properties that determine the logic of reasoning.

Reasoning itself changes; it evolves. Logic becomes the field that investigates the evolution of reasoning, as the "science of the necessary laws of thought" and of the "laws of the evolution of thought" (1.444).[118] For Peirce, defining the evolution of thought entails, as it did for Aristotle, the logical classification of how thought is produced. It is through his classification of the sciences, the commitment to the notion of an ever evolving universe, and the role of observation in the production of thought, where we might begin to evaluate both how Peirce employed the microscope and how the microscope informed Peirce's thought.[119]

As might be expected, Peirce draws the origin of the different departments of science from the "essence of science," by which he means those "living men" devoted to the "living process" (1.234) of pursuing "truth for truth's sake" (1.44).[120] Driven by a pure desire for truth, early scientists equipped themselves with instruments of observation particular to the phenomena they wished to understand. Their unique means of

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epistemology, logic, etc. The argument, that the scientific method will, unchecked, result in unethical and sometimes horrifying events is often rightly applied to science. But it is also rightly applied to metaphysics. Peirce does not appear to offer as much in the way of ethics as he does for other traditional branches of philosophy.

[118] There is an interesting back and forth, here, between "law" and "evolution" in connection with "logic," for in Peirce's conception, "laws" are already mutable; they evolve, becoming increasingly more regular. The "laws of evolution" thus mirrors the "evolution of laws." Logic, as "general semeiotic" (1.444), might be thought of as the reasoning of reasoning, the science of science, the criticism of criticism, for "logic is," as Peirce tells us in "Why Study Logic?," chiefly "criticism of reasoning as good or bad" (2.144). Peirce wants to replace "metaphysics" with "metacriticism," The former he ties to philosophy, the latter with science.

[119] Those familiar with Peirce's classification of the sciences will understand how demanding a task it would be to adequately summarize his system; there are far too many branches to make for a successful abridgment regarding my project. I refer the reader to volume I, book II of the *Collected Papers,* as well as volume I, book I, chapter two, for more information.

[120] Both "science" and the attempted "classifications of science" suffer, according to Peirce, from a neglect to properly address this humanist essence of science. Such classifications fail to emphasize the mutable nature of science with its "most marked characteristic," that "it is in an incessant state of metabolism and growth" (1.232). Peirce argues that previous classifications that treat science as a "mere abstract definition," separated from the processes undertaken by living men and women, or that refer to the dictionary definition of science as "systematized knowledge," or the Greek notion of *έπιστήμη*, "comprehension," is to classify science not at it exists, but as the "classifier hopes may some time exist" (1.233). The "essence of science," for Peirce, names a "living historical entity" (1.44) emerging from the collective inquiry of its imaginative and methodical practitioners.

observation resulted in different aggregates of experience that consequently produced certain conceptions intelligible only to those familiar with that manner of viewing the world—thus, if one was to bring together "a bacteriologist and astronomer," they "will hardly know what to say to one another; for neither has seen the world in which the other lives;" the bacteriologist living in a world construed by the microscope, the astronomer in one construed by the telescope. "True," Peirce concedes, "both use optical instruments; but the qualities striven for in a telescopic objective are of no consequence in a microscopical objective" (1.236). Observation, then, becomes the chief qualifier determining the hazy and overlapping borderlines between the differing branches of science, and the microscope becomes the primary means of illustrating the differing modes of observation. Peirce states the case more explicitly in a section on observation found in the manuscripts for the unfinished *History of Science*. Here he writes,

> It will be found upon close examination that that which renders the modes of thought of the students of a special branch of science peculiar is that their experience lies in a peculiar region. And the cause of this is that they are trained and equipped to make a peculiar kind of observations. The man who is continually making chemical analyses lives in a different region of nature from other men. The same thing is even more true of men who are constantly using microscopes. It comes to this, that sciences must be classified according to the peculiar means of observation they employ. (1.100-1)

Again, Peirce employs the microscope to figure the defining characteristics of the differing branches of science. But more importantly, the passage implies how the microscope serves not only as a particular means of observation, but as a means of understanding the significance of observation itself, as well as Peirce's reasoning about that which conditions his system of classification. Firstly, he alleges that his point is confirmed by means of "close examination," already suggesting the microscopist's method, who does nothing if not examine objects closely. Secondly, he highlights the microscope as presenting a prevalent means of observation that initiated the splitting of the particular branches of science, as representative of a now distinguishable "region of nature." So, it is not merely that Peirce classifies the microscope, but that the microscope made it possible, and ultimately demanded, that he formulate modern classifications in the first place, in order to address the branches of science generated by the microscopical mode of observation. The microscope presents a mode of observation that allowed observation itself to become the defining characteristic classifying the sciences as it provides one of the several modes to be classified. Peirce's project thus arguably hinges on the microscope; it is impossible to understand the classification of the sciences, and its consequences for his later philosophical positions, without first understanding the scientific instrument itself.

His commitment to evolution merges with his emphasis on observation in a way that further defines the importance that the microscope had on his thinking. Immediately after defining observation as the key to classification, Peirce moves to a discussion of the prominent theories of evolution, represented by Charles Darwin, Jean-Baptiste Lamarck, and the theory called "cataclysmal evolution." These two sections, titled "Observation" and "Evolution" respectively, are part of his larger project to define science through charting its historical developments, where charting the history of science amounts to charting the *evolution* of science, tracing its hereditary growth from homogeneity to heterogeneity, and determining the diversification it undergoes while working out its definite end.[121] And because science is so profoundly informed by the theory of evolution, one might call its history "the evolution of the theory of evolution."[122] But Peirce gives the screw an additional turn, for it is not merely that the "theory" of evolution has evolved, but that evolution itself has evolved, a concept he explores in "The Architecture of Theories" when he claims, "Now the only possible way of accounting for the laws of nature and for uniformity in general is to suppose them results of evolution.

[121] See 1.174ff and 1.204, where Peirce defines evolution as "nothing more nor less than the working out of a definite end."

[122] When Peirce introduces the section with, "The evolutionary theory in general throws great light upon history and especially the history of science" and, "As great a light is thrown upon the theory of evolution in general by the evolution of history, especially that of science" (1.103), he performs a metacritical back and forth. The implied premise, here, is that if one is to accept a theory of evolution, which "means nothing but *growth* in the widest sense of that word" (1.174), than one must accept that the theory itself had evolved. This turn, where Peirce applies evolutionary theory to the theory of evolution, not only maintains the soundness of the argument, but simultaneously showcases Peirce's tendency towards the metacritical as a means of verification as it rejects the axiomatic character of infallibilist thinking—embodied by belief systems that assume mechanical laws to be the only agency of nature and thus think "that everything always was substantially as it is now" (1.175). This mindset informs a mechanistic ideology that endorses a static and pre-established conception of the universe (ordained by God), the immobility of the individual's station of life, and defines the worldview that Emerson adamantly challenged.

This supposes them not to be absolute, not to be obeyed precisely. It makes an element of indeterminacy, spontaneity, or absolute chance in nature" (6.13).

Evolution, particularly in the Darwinian model, functions by means of chance variations.[123] Peirce enlarges the model to conceptualize the origin of the universe and the laws of nature, but he does not simply conclude with the model's application. Instead, he argues that those features of evolution that scientists have systematized into a theory undergo the same processes that the theory names. The idea is later expressed in Peirce's speculative cosmological account, a kind of scientific origin story, concluding "The Architecture of Theories":

> It would suppose that in the beginning—infinitely remote—there was a chaos of unpersonalized feeling, which being without connection or regularity would properly be without existence. This feeling, sporting here and there in pure arbitrariness, would have started the germ of a generalizing tendency. Its other sporting would be evanescent, but this would have a growing virtue. Thus, the tendency to habit would be started; and from this, with the other principles of evolution, all the regularities of the universe would be evolved. (6.33)[124]

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[123] Those familiar with Peirce's notion of *tychism*, or the positive and operative existence of chance throughout the universe, will no doubt see the connection between it and Darwinian evolution. References to, or elements that ultimately inform, Peirce's *tychism* thesis can be found throughout the *Collected Papers*. Here is one such example from "The Logic of Continuity":

> The very first and most fundamental element that we have to assume is a Freedom, or Chance, or Spontaneity, by virtue of which the general vague nothing-in-particular-ness that preceded the chaos took a thousand definite qualities. (6.200)

Peirce was committed to the idea that Being must be thought of as a matter of degrees growing from a state of non-existence to existence. "In the original chaos," Peirce declares, "where there was no regularity, there was no existence" (1.175). That existence took shape marks a single possibility from innumerable potentialities. "Chance" names the mode in which the tendency to habit was ushered into existence from nothing.

[124] Peirce had defended what he called his "evolutionary cosmology" in a series of articles published in *The Monist*. He restates the case in a later issue, included in volume VI of the *Collected Papers*, writing,

> In an article published in *The Monist* for January, 1891, I endeavored to show what ideas ought to form the warp of a system of philosophy, and particularly emphasized that of absolute chance. In the number of April, 1892, I argued further in favor of that way of thinking, which it will be convenient to christen *tychism* (from *τύχη*, chance). A serious student of philosophy will be in no haste to accept or reject this doctrine; but he will see in it one of the chief attitudes which speculative thought may take, feeling that it is not for an individual, nor for an age, to pronounce upon a fundamental question of philosophy. That is a task for a whole era to work out. I have begun by showing that *tychism* must give birth to an evolutionary cosmology, in which all the regularities of nature and of mind are regarded as products of growth, and to a Schelling-fashioned idealism which holds matter to be mere specialized and partially deadened mind. (6.102)

Whereas in other passages Peirce appears hesitant to fully promote his "evolutionary cosmology," phrasing it in the speculative, here he confidently asserts the cosmology as contingent to his thesis of *tychism*.

Laws are neither absolute nor determined by anything other than a general tendency of existing things towards regulation, or habits.[125] And from out of this "original chaos" characterized by a lack of regularity and reality, this dream-like confusion (1.175), the very principles of evolution evolve, including time, logic, chance, and continuity.

We might now better understand Peirce's motivation for interrogating the theories of evolution in evolutionary terms, and *a fortiori*, the importance this critique has on determining Peirce's later thought in its relation to the microscope, for observation, the key to scientific classification, also becomes the key to understanding the evolution of science. Peirce summarizes the three prominent theories of evolution as follows: the Darwinian model understands evolution as a function of "purely fortuitous and insensible variations" passed from parent to offspring in reproduction; the Lamarckian model similarly understands evolution as a "succession of very minute changes," but sees these changes as the results of strivings through an individual's organic relationship with its environment; the "theory of cataclysmal evolution" maintains that the changes "have not been small and have not been fortuitous," but occur when a sudden (or cataclysmic) event in the environment erupts, putting certain organs at a disadvantage.[126] Peirce claims that it is highly probable that "all three of these modes of evolution have acted," and that the theory of cataclysmic evolution has probably been the most efficient (1.104).

After determining each manner of evolution, Peirce's next step is to apply them to the production of thought named by science. The Darwinian account might focus on a chance modification of a judgment that is later passed along, causing a corresponding modification of the belief-habit that then influences the next recall of the original

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[125] Another passage where Peirce argues for the mutability of natural laws, and that might easily support the connections drawn between his work and that of Lucretius, appears in "The Architecture of Theories":

> Just as, when we attempt to verify any physical law, we find our observations cannot be precisely satisfied by it, and rightly attribute the discrepancy to errors of observation, so we must suppose far more minute discrepancies to exist owing to the imperfect cogency of the law itself, to a certain swerving of the facts from any definite formula. (6.13)

[126] More specifically, under the Darwinian model, the survival of a species depends on lucky genetic mutations that occur during reproduction, whereas for Lamarck, the changes that determine the evolution of a species do not take place through reproduction but through individual confrontations with environment. The theory of cataclysmal evolution holds that evolutionary changes chiefly take place in reproduction, but as a response to environment, not fortuitously. The theory assumes, as Peirce summarizes, that organs "are particularly apt to sport in reproduction and to change," and thus inevitably become modified "in the way which adapts them better to their recent mode of existence" (1.104).

judgment. The elements of entertaining tentative hypotheses, such as omissions, insertions, or changes in the point of view, occur fortuitously, creating differing explanations that ultimately determine the most believable. This is an obviously slow process, as it takes years of consideration and experimentation amongst scientists to evolve such strong explanations. A Lamarckian evolution of science would progress equally slowly, taking the form of perpetually modifying opinion so that any thesis would best represent the increasing data and observations forming the scientific environment. It is clear that aspects of each mode of evolution have informed the evolution of science.[127] However, in contrast to the slow progress of the Darwinian and Lamarckian models, Peirce maintains:

> [T]his is not the way in which science mainly progresses. It advances by leaps; and the impulse for each leap is either some new observational resource, or some novel way of reasoning about the observations. Such novel way of reasoning might, perhaps, be considered as a new observational means, since it draws attention to relations between facts which would previously have been passed by unperceived. (1.109)

Observation again becomes the key to understanding the evolution of science. But its role is slightly modified, here, to emphasize that the impulse for each leap in scientific evolution is embodied in instruments like the microscope. Peirce further confirms the significance of instruments of observation for his account when he argues that "the great landmarks in the history of science are to be placed at the points where new instruments, or other means of observation, are introduced" (1.102).[128] The microscope clearly falls

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[127] Peirce includes a few examples, such as the classification of the chemical elements from Berzelius to Mendeléeff, and the advancements witnessed in the branches of physics, which undoubtedly progress, but nonetheless "remain for a long time without any decisive conquests" (1.108).

[128] Peirce's premise, here, that the production of novel means of perception significantly influences, even determines, thinking is one shared by Walter Benjamin, who echoes the insight forty years later in "The Work of Art in the Age of Mechanical Reproduction," writing,

> During long periods of history, the mode of human sense perception changes with humanity's entire mode of existence. The manner in which human sense perception is organized, the medium in which it is accomplished, is determined not only by nature but by historical circumstances as well. The fifth century, with its great shifts of population, saw the birth of the late Roman art industry and the Vienna Genesis, and there developed not only an art different from that of antiquity but also a new kind of perception. (222)

Though Benjamin is specifically addressing the modern reproduction of art and the potential decay of the "aura" of the art work (the uniqueness of the work of art, that which determines the "history to which it was subject throughout the time of its existence" (220)), while Peirce addresses the classifications of science, under the category of "some new observational resource," and must have been the instrument Peirce had in mind when determining his evolution of science, as the illustration immediately following this account attests.

Peirce exemplifies his claim that instruments of observation trigger the evolution of science through reference to the discoveries of Louis Pasteur, "who began by applying the microscope to chemistry" (1.109). When studying the effects of ferments—groups of living organisms, like yeasts, bacteria, and enzymes, that cause fermentation—Pasteur, though use of his microscope, challenged the then dominant medical theory maintained by Claude Bernard that "a disease is not an entity but merely a sum of symptoms" (1.109), discerning a more likely cause for particular diseases that may be tested and accepted. Peirce defines Bernard's dictum as "pure metaphysics which only barricaded inquiry," and so Pasteur's hypothesis, generated by the microscope, exemplifies not only a moment where "new ideas [are] connected with new observational methods" as "the usual process of scientific evolution," but also how instruments like the microscope inform an increasing tendency towards anti-metaphysical thinking that will ultimately define Peirce's philosophical positioning.

Peirce appears to employ the microscope in a similar way as did Pasteur: to isolate a particular and previously unperceived phenomenon that determines aggregate consequences. That is, Peirce uses the microscope here to figure a point, a specific and crucial point, a "landmark" point, without which science cannot be properly understood. The microscope becomes Peirce's choice reference and favored means to account for a particular mode of understanding the world. Just as we can only understand the microscope by means of its scientific employment, we similarly can only understand science by means of its employment of microscopes. And because science, as a living entity, names a mode of life contingent upon the natural affinity between mind and world,

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the insight is fundamentally the same: perception is not absolutely independent from technology and changes in perception consequently produce changes in human understanding.

it is not difficult to understand that the microscope, by shaping this mode of life, consequently shapes the world that it observes.[129]

To update Aristotle is to redefine the modern world, a world created by science and the use of scientific instruments.[130] Peirce's assumption of instruments like the microscope, those instruments that have "transported our race to another planet," brings him to the following conclusion:

> Some of the old beliefs have no application except in extended senses, and in such extended senses they are sometimes dubitable and subject to just criticism. It is above all the normative sciences, esthetics, ethics, and logic, that men are in dire need of having severely criticized, in their relation to the new world created by science. (5.513)

As we will see, Peirce investigates and employs the microscope in order to better understand this new world created by it. He uses it to distinguish the logical mind, one that is best suited to fulfill the hope that an affinity between it and the world exists—the logical mind is a microscopical mind, a myopic mind. He uses it to encourage a manner of understanding nature as conditioned by dissection, to name a specific means of appropriating truth through the magnification of the particular, a process he sees as suppressed throughout the history of philosophy, and that, as my previous chapter has argued, challenges Emerson's philosophical orientation. He uses it to express the importance of evaluating the particular and the minute prior to the hasty overvaluation of the whole. And he uses it to verify his position concerning science as a superior method to metaphysics, as a means of pushing forward his decidedly anti-metaphysical stance. Philosophy, for Peirce, is in dire need of resuscitation, and the microscope is the primary instrument needed to breathe new life into the discipline. The microscope offers a method of observation that will bring philosophy out of its stagnant condition, by enlivening conversations with a new demand for precision, and for a new approach to questions, an approach defined by myopia, dissection, and the particular.

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[129] The natural affinity between mind and nature that Peirce routinely defends is still regarded as an anti-metaphysical position, in that the connection, while non-arbitrary and seemingly created, did itself emerge by chance.

[130] I think Peirce would agree that Aristotle's method was not wrong, but that, because of inventions like the microscope, his system had become outmoded.

The Microscopical Mind

As suggested above, a substantial similarity between Peirce's science and Emerson's philosophy is found in the confidence each ascribes to a natural harmony between mind and world, what Emerson calls the "radical correspondence between visible things and human thoughts" ("Nature," *W* 1: 29). Emerson understood the tools with which we inspect, observe, and organize our world as representations of the human mind and their essential link with nature. Peirce would no doubt agree with Emerson's assessment, here, as he understands such scientific tools as borne out of those original groups of like-minded scientists trained in varying modes of observation. The position that a natural agreement exists between mind and nature is significant as it—and Peirce concedes this point—forms the ground upon which his later conclusions regarding the value of science and humankind's instinctual capacity for logic depend. "Every attempt to understand anything," Peirce insists, "supposes, or at least *hopes*, that the very objects of study themselves are subject to a logic more or less identical with that which we employ" (6.189). Faith in the agreement between mind and nature is necessary not only for the advancement of science, but for any method of understanding the world. And though it would seem that to depend on faith would be to depend on spiritual or metaphysical dogma, for Peirce, such faith actually encourages a scientific mode of engagement, for science is nothing other than the positing of hypotheses, or guesses, and working them out. Peirce asks, "How do I know that anybody but myself ever existed or even I myself exist … and that all this business is not an illusion from top to bottom? Answer: I don't know. But I am trying the hypothesis that it is real, which seems to work excellently so far" (1.168). Whereas the history of philosophy is replete with authors seeking certainty to ground philosophical systems, Peirce appears satisfied with the uncertainty underlying science.

Yet, for all his tactful phrasing of the case in the speculative, as a noble lie that one—even the scientist—must assume in order to improve the intellect, Peirce develops an increasingly decisive certainty that the mind/nature affinity exists, which consequently grounds some of his riskier philosophical positions. He includes, for example, a quick syllogism in the Eighth Lowell Lecture of 1903, titled "How to Theorize," where he argues, "Certain uniformities, that is to say certain general ideas of action, prevail throughout the universe, and the reasoning mind is [it]self a product of this universe. These same laws are thus, by logical necessity, incorporated in [mankind's] own being" (5.603).[131] Peirce will draw conclusions regarding the problems of cardinal numerals, the associations of ideas, and the ontology of sensible qualities, intuitions, and the nature of language from the premise that "the mind of man is adapted to the reality of being" (4.157).[132] In "A Theory of Probable Inference," he goes so far to say: "It cannot any longer be denied that the human intellect is peculiarly adapted to the comprehension of the laws and facts of nature" (2.750).[133] It would appear that Emerson's proposition has earned Peirce's scientific verification.

Verifying the correspondence is important for Peirce to validate science as the venerated method of fixing belief, the method that has had "the most wonderful triumphs in the way of settling opinion," and the only one "which presents any distinction of a right and a wrong way" (5.384-5). When considering "any preference to one kind of theory over another," Peirce is sure to remind his readers that "every single truth of science is due to the affinity of the human soul to the soul of the universe, imperfect as that affinity no doubt is" (5.47).[134] The scientific method, Peirce maintains, is the method

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[131] This passage displays the pattern and structure of a basic categorical syllogism, consisting of a major premise, a minor premise, and a conclusion, and might be diagramed as follows:

Major Premise: Laws prevail throughout the universe.
Minor Premise: The reasoning mind is a product of the universe.
Conclusion: The reasoning mind incorporates the prevailing laws.

[132] This premise, and its importance for Peirce's positions concerning the problems alluded to above, may be found in the selection from "Recreations in Reasoning" included in 4.153-69.

[133] This essay was originally published as the seventh and concluding essay of The Johns Hopkins *Studies in Logic*, edited by Peirce and published in 1893. It was intended to be Essay XIV of his *Search for a Method*, which was to include revised versions of essays such as "The Fixation of Belief," "How to Make Our Ideas Clear," and "The Doctrine of Chances," among others. Announced in 1893, Peirce never completed the project.

[134] Peirce anticipates an objection that this assertion might provoke, namely that the anthropomorphic nature of the position complicates any pretended objectivity, and thus discredits his argument in "The Fixation of Belief," where he contends, "There are Real things, whose characters are entirely independent of our opinions about them" (5.384). Peirce concludes the passage quoted above by writing, "To say, therefore, that a conception is one natural to man, which comes to just about the same thing as to say that it is anthropomorphic, is as high a recommendation as one could give to it in the eyes of an Exact Logician" (5.47). He then attaches the following footnote:

that best preserves this correspondence between the mind and the "soul of the universe," leading to his investigation of what is for him the most important and most evolved natural instinct, namely, the power of logical reasoning. He closes "How to Theorize" by introducing the instinct, here articulated in a somewhat more poetic, possibly Emersonian, style of expression:

> In this way, general considerations concerning the universe, strictly philosophical considerations, all but demonstrate that if the universe conforms, with any approach to accuracy, to certain highly pervasive laws, and if man's mind has been developed under the influence of those laws, it is to be expected that he should have a *natural light*, or *light of nature*, or *instinctive insight*, or genius, tending to make him guess those laws aright, or nearly aright. (5.604)[135]

Peirce's argument regarding the natural agreement between mind and nature not only discloses a point of consonance between him and Emerson—as the language of "natural light" and "light of nature" also suggests—but offers a frame of reference for interpreting

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> I would not have anybody accept any doctrine of logic simply because minute and thorough criticism has resulted in making me perfectly confident of its truth. But I will not allow this scruple to prevent my saying that for my part … I have after long years of the severest examination become fully satisfied that, other things being equal, an anthropomorphic conception, whether it makes the best nucleus for a scientific working hypothesis or not, is far more likely to be approximately true than one that is not anthropomorphic. (5.47)

Peirce again voices the objection in a (possibly) undelivered passage from Lecture IV of the "Lectures on Pragmatism" (1903):

> I hear you say: 'This smacks too much of an anthropomorphic conception.' I reply that every scientific explanation of a natural phenomenon is a hypothesis that there is something in nature to which the human reason is analogous; and that it really is so all the successes of science in its applications to human convenience are witnesses. (1.316)

While he entertains the challenge of this potential naysayer, he ultimately rejects the opposition on the grounds that the anthropomorphic conception is the most approximate and worthwhile hypothesis. As a good scientist, he cannot say with absolute or universal certainty that a direct, analogous correspondence exists between mind and nature—that would be to ignore the law of fallibilism that he argues defines the scientific man. But, to explain anything presupposes at the very least a faith that this correspondence exists; and, he might continue, evidence that this correspondence exists is everywhere, notably attested to by the conveniences to life generated by the successes of science. Regardless of Peirce's success in answering the objection, the point, for my purposes, is that his answer depends on the existent affinity between mind and nature. To put the case more strongly, if it is true that this affinity exists, if we accept the harmony between mind and nature, then the anthropomorphic conception is the only possibility of a logical conclusion—to resist anthropomorphic conceptions is to negate the premise that logic functions in a compatible and corresponding mode with nature.

[135] Clearly, Peirce is persuaded by the argument, as he continues the passage cited above, writing, "This conclusion is confirmed when we find that every species of animal is endowed with a similar genius," and closes the essay with "The history of science, especially the early history of modern science … completes the proof by showing how few were the guesses that men of surpassing genius had to make before they rightly guessed the laws of nature" (5.604).

his use of the microscope when it appears as a stand-in for the mind and its relationship with the world. The mind, as something borne out of nature, developed under the influence of those laws that evolve and permeate the universe, must be understood—as must the universe itself be in Peirce's cosmology—as sustaining some kind of fundamental logic, an unfolding rationality to which our minds and our methods of reasoning follow suit.

The "logical instinct," or "instinctive insight," then, is Peirce's answer to the question of how the mind and the universe maintain their "radical correspondence." "[T]o accept propositions which seem perfectly evident to us," Peirce asserts in "How to Make Our Ideas Clear," "is a thing which, whether it be logical or illogical, we cannot help doing" (5.392)[136] Not only do we have this "reasoning instinct," but, as Peirce endeavors to show, "we have an instinctive *theory* of reasoning, which gets corrected in the course of our experience" (2.3). The theory of reasoning is nothing other than logic, the "science of the necessary laws of thought" (1.444), the "theory of the conditions which determine reasonings to be secure" (2.1).[137] We form beliefs by habit; we cannot help doing so. We are animals who take on the "habit" of "drawing inferences from given premises" (5.367), thus leading Peirce to claim in "The Fixation of Belief," that "[w]e are, doubtless, in the main logical animals" (5.366).[138] And this instinct, this natural

[136] Peirce puts the claim another way in "Why Study Logic?," when he writes, "there are instinctive ways of forming opinions," a notion he sees as "impossible to deny" (2.175). "Why Study Logic?" names the second section of the second chapter, "Pre-logical Notions," of the "Minute Logic."

[137] Logic is, of course, only a theory, never a statement of absolute truth and as such must succumb, like all things, to possibility, chance, and evolution. See 2.1ff for a more complete understanding of Peirce's argument concerning the link between the "reasoning instinct" and the "theory of logic" it generates.

[138] Peirce routinely returns to this working hypothesis that humans have evolved this "reasoning instinct," as references can be found scattered throughout the *Collected Papers*. In chapter one of the "Minute Logic" (1902), for example, he writes, "We all have a natural instinct for right reasoning, which, within the special business of each of us, has received a severe training by its conclusions being constantly brought into comparison with experiential results" (2.3). Chapter three of volume II, book I, titled "Why Study Logic?," contains a more comprehensive argument, where Peirce complicates the "popular notion" that "Reason is far superior to any instinctive way of reaching the truth" (2.176). Peirce maintains, here, that logic, the theory of reasoning as bread from instinct, is itself instinctual. It is not that unconscious instinctual acts are themselves logical or reasonable—in fact, by definition they cannot be, for logic implies conscious and deliberate control while instinct is defined as those habits over which we have no control (see 2.182ff)—but reasoning itself, as a habit we cannot help but perform, is itself an instinctual operation of the mind. Peirce would likely put this instinctual force of reasoning in the category of Firstness, the category of possibility, freedom, feelings, and pure presence; ideas that exist without negation and can

inclination to form opinions, is a quality of the mind that is determined by, or has evolved within, the evolution of the laws of the universe, paralleling Peirce's cosmology. Reasoning is a habit just as gravity or continuity is a habit—laws towards which the world tends—and thus signals the ever increasing regularity consequent of a growing universe. Peirce makes the connection that the functioning of logic similarly represents the unfolding of the universe in the following passage:

> Looking upon the course of logic as a whole we see that it proceeds from the question to the answer—from the vague to the definite. And so likewise all the evolution we know of proceeds from the vague to the definite … The homogeneous puts on heterogeneity. (6.191)

Logic thus works in the same manner as does evolution, positing potential and vague "may-bes," indefinite, not yet discerned questions, and formulating approximate answers that are never "true," but serve as temporary settlements of opinion, the closest we may come to factual knowledge.[139] In this way, the reasoning instinct further qualifies Peirce's argument that the "mind is [it]self a product of this universe." The hypothesis that Peirce is working out, that "the logic of the universe is one to which our own aspires" (6.189), is what allows him to make the case for the necessity of the "logical mind" as that which most closely approximates us to reality, and thus formulates a ground on top of which a comprehensive philosophical or scientific system may be built, once the metaphysical registers of truth and falsity are redefined as the habitual formation of beliefs.[140]

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never be properly articulated due to their phenomenal nature—ideas in this category are mere "may-bes" (see 1.300ff).

Additionally, Peirce discusses instinctual reasoning in relation to the adaption of the mind to nature, under a section appropriately titled "Mind and Nature," found in volume VI of the *Collected Papers* (6.414-8). The instinct has everything to do with that foundational feature of the scientific method of forming hypotheses, or "guesses." See especially 6.491, where Peirce compares "man's power of guessing at the truth with the instincts of animals," and how this power might be explained by "the action of natural selection." See also 6.531, where Peirce defines the "guessing-instinct."

[139] That is, Peirce formulates a parallel between the movement of logic and the movement of the evolution of the universe: logic moves from the vague to the definite, from question to answer, which is the same as the evolution of the universe from irregularity to regularity, or chaos to law.

For more on Peirce's attitude regarding the impossibility of reaching facts-as-such, see 1.141, where he argues, "All positive reasoning is of the nature of judging the proportion of something in a whole collection by the proportion found in a sample. Accordingly, there are three things to which we can never hope to attain by reasoning, namely, absolute certainty, absolute exactitude, absolute universality." The notion of drawing scientifically valid conclusions from samples, or parts of a whole, is linked to Peirce's notion of dissection, a concept that will be explored in its relationship with the microscope below.

[140] The complete passage, from Peirce's 1898 lecture titled "The Logic of Continuity," is as follows:

The question, then, is not merely how Peirce comes to this conclusion—that the mind and nature maintain affinity—but what *kind* of mind best illustrates or discloses the connection of it with the laws of nature? The answer for Peirce, as it was for Emerson, is one that involves the microscope. Just as Emerson encouraged a "scholarly mind" as the most proper, a mind he illustrates by the inventive application of microscopical terminology to define it as that through which those universal laws might best converge, Peirce will emphasize a "logical mind," and will similarly employ the microscope to characterize it. This logical/microscopical mind apprehends and organizes the world in a manner most appropriate to it, in a way that most closely resembles the bulk of instinctual knowledge and the natural evolving laws of the universe. Peirce's employment of the microscope as a stand-in for his conception of the logical mind—the "logical mind" becomes the "microscopical mind"—represents one of his more common usages of the instrument, indicating the importance the microscope had for his epistemology.

The quotation from "Logic and Spiritualism" cited above, where Peirce supposes that scientific specialists "are myopic minds, seeing microscopically" (6.561), suggests that for Peirce the scientist cultivates a different kind of thinking, one distinguished by the microscopical mode of observation, that is, one that isolates the particular and emphasizes the minute. When discussing the relationship between logic and ethics, he, like Emerson before him, unmistakably likens this kind of logical thinking with lens-craft:

> That the logic of the universe is more rudimentary than our subjective logic is a hypothesis which may be worth examination in some stage of culture, but it is too violently at war with all the lessons which this age has learned for any man nowadays to embrace it with that ardor with which a man must embrace the theory which he is to devote his best powers to developing and bringing to the test of experience. Whatever else may be said for or against that hypothesis, that which we of these times out to try is rather the hypothesis that the logic of the universe is one to which our own aspires, rather than attains.

Peirce describes, here, the hypothetical nature of his system, dependent as it is upon assuming the natural affinity between mind and world. He describes how his conclusions emerge from the position that the logic of the universe has, at the time of his writing, arrived at a more advanced stage than has human reasoning. Reasoning, Peirce will argue, is basically the same as *expecting* and *guessing*, which amounts to a kind of faith in the *may-be* (see 2.144-50); reasoning, as habitual, produces beliefs and regularities, just as the evolving world does. What is important is that habits influence and direct behavior, thus causing real-world change. The mind and nature correspond; and, even if only imperfectly so, the point is they are not arbitrarily, but approximately, related.

> Before my logic was brought under the guidance of ethics, it was already a window through which much important truth could be seen, but dim with dust, distorting details by striæ. Under the guidance of ethics I took it and melted it down, reduced it to a fluid condition. I filtered it till it was clear. I cast it in the true mold; and when it had become solid, I spared no elbow-grease in polishing it. It is now a comparatively brilliant lens, showing much that was not discernible before. I believe that it will only remain to those who come after me to perfect the processes. I am as confident as I am of death that Logic will hereafter be infinitely superior to what it is as I leave it; but my labors will have done good work toward its improvement (2.198)

Logic is microscopical in that it too reveals an "invisible world;" it is a lens through which previously indiscernible phenomena may be disclosed. And those who come after Peirce, who may make modifications to his logic, parallel those lens makers who made similar advancements in achromatic microscopical technologies. The image is somewhat counterintuitive, in that looking through a lens could just as easily be considered a distortion of vision, but Peirce understands lens-aided observation as a clarifying adaptation, much like the addition of logical theory is to muddled philosophical questions. While Emerson used the lens to represent the convergence of divine laws in the mind of the scholar, Peirce uses it to represent logic; a filtered, undistorted, clear logic, aimed towards minutia and details, displaying never before seen phenomena that requires the modernizing of traditional kinds of thinking—from the presbyopic to the myopic.

Though he uses the microscope to differentiate the scientist from "presbyopic minds," which, considering the language of the passage, implies philosophers generally, and metaphysicians in particular, he will push the illustration to similarly differentiate the logician from the mathematician.[141] When contemplating the nature of the *fact*, for

[141] Here is the complete passage from "Logic and Spiritualism":

> "Myopy" and "presbyoby": inability to focus objects too far away; corresponding inability for objects too near. I suppose we scientific specialists, technical sharps, connoisseurs, travelers, scholars, are myopic minds, seeing microscopically, but only things under our several noses. Presbyopic minds, with defective accommodation, would be able to see only what stands open to all men's apprehension: these are fogies, average board-members, men whom one believes to be very wise, but whom one perceives to be very ignorant. (6.561)

The term "accommodation," in physiology, means "The ability to focus on objects at different distances from the eye." It also refers to "The action of adapting or adjusting effectively to new or changed conditions," as well the "The action of supplying with what is suitable or necessary; (hence) something example, and concluding that it "must in some way [be] connected with the number two" (1.430), Peirce investigates how mathematicians and logicians differently approach the question of dyads.[142] The mathematician, on the one hand, would likely find the question ridiculous: "A pair, he may say, is just an object and an object, and that is all that is involved in this puffed-category of the *dyad*" (1.442). But the logician, on the other hand, who understands each object as a fact, as a thing, and thus, as a duality of (1) a subject and (2) its resistance, its "reacting against the other things of the universe" (1.436),

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which fulfils a need, or provides assistance" (see "accommodation, n."). Peirce likely had each of these definitions of the term in mind in relation to the microscope when composing this passage, considering how regularly he characterizes instruments like the microscope as the necessary tools that may successfully adapt philosophy to the modern era, and thereby revitalize its outmoded forms of reasoning, too dependent, as they are, on ecclesiastical metaphysics and presbyopic vision.

In addition, my understanding that Peirce insinuates philosophers as the presbyopic minds in this passage comes from the similarity with which he describes the kinds of observations philosophy undertakes, as discussed in the "Minute Logic" (1902), titled "A Detailed Classification of the Sciences" in volume I, book II, chapter three of the *Collected Papers*. Here, he writes, "Class II is philosophy, which deals with positive truth, indeed, yet contents itself with observations such as come within the range of every man's normal experience" (1.241). Peirce again employs the microscope to illustrate his point concerning philosophy's "peculiar" type of observation, writing, "Evidently, therefore, no microscope or sensitive film would be of the least use in this class" (1.241). He repeats his take on philosophy's distinct mode of observation, as well as the illustration of the microscope to define this distinction, a few passages later, in a manner somewhat less reproachful: "philosophy, whose business it is to find out all that can be found from those universal experiences which confront every man in every waking hour of his life, must necessarily have its application in every other science. For be this science of philosophy that is founded on those universal phenomena as small as you please, as long as it amounts to anything at all, it is evident that every special science ought to take that little into account before it begins work with its microscope, or telescope, or whatever special means of ascertaining truth it may be provided with" (1.246). Philosophy, like the presbyopic mind, is concerned with phenomena as they appear to "all men's apprehension," and does not make use of, or accommodate itself with, special means of observation like the microscope, here defined as an instrument whose purpose is to "ascertain truth." The notion of philosophy as concerned with this kind of "common" observation linked with the microscope recurs in Peirce's "The Logic of Mathematics in Relation to Education" (*Educational Review*, 1898: 209-16, reprinted in volume III of the *Collected Papers*), where he argues, "philosophy, although it uses no microscopes or other apparatus of special observation, is really an experimental science, resting on that experience which is common to us all" (3.560). Logicians, Mathematicians, and Philosophers, all make observations particular to their field that generates equally particular modes of thinking; the common feature of how Peirce works out these different manners of observation, and thus styles of thinking, is his use of the microscope to discern them.

[142] That is, a fact names a coincidence in which "two phenomena are related in one way to one another" (1.429). Facts exist in Peirce's universal category of Secondness—the category of experience, negation, struggle, and connections of qualities, contingencies, etc.—and only arise to our perception of them through resistance: "Whenever we come to know a fact, it is by its resisting us. A man may walk down Wall Street debating within himself the existence of an external world; but if in his brown study he jostles up against somebody who angrily draws off and knocks him down, the sceptic is unlikely to carry his skepticism so far as to doubt whether anything beside the ego was concerned in that phenomenon. The resistance shows him that something independent of him is there" (1.431). The category of fact contains two features with which the logician is concerned, namely, *contingency* (or the accidentally actual) and *brute force* (that which involves an unconditional necessity without law or reason). See 1.427ff.

understands the mathematician's concession to such unqualified uses of terms like "object" as "fatally inaccurate" (1.442). The mathematician may overlook the duality of the single object in a way that the logician, geared towards the particular, cannot. It is this kind of thinking enacted by the logician, who isolates the terms of the other sciences to emphasize their particularity, that Peirce likens to the microscopical: "But accepting this amendment, which to his customary way of thinking is *microscopic*, the mathematician will be inclined to say, here is a perfect definition; and excepting a few little corollaries, there is nothing more to be said of the dyad" (1.443—my emphasis.). The mathematician would thus consider the logician's manner of thinking as "microscopical," a characterization with which Peirce clearly agrees. The microscopist, like the logician, brings a distinct and discernible object beneath the lens, and by increasing its level of magnification, reveals the structures and the variety of features composing its semblant appearance.[143] The remainder of Peirce's commentary on the dyad presents a steadily increasing magnification, as he divides and subdivides the separate terms and steps of its various features, locating pairs, pairs of pairs, etc. to reveal "a whole series of species of dyads" (1.470).

So the kind of thinking enacted by the logician, and the language with which Peirce defines this kind of thinking, is one characterized by the microscope, a reading further confirmed by a passage appearing in chapter three of the "Minute Logic," where Peirce likewise distinguishes the logician from the mathematician. Again, as the microscopist focuses on the minute parts composing an object, the logician, contrary to the mathematician, seeks to discern the minute and elementary steps of any method of reasoning. "The mathematician," Peirce explains, "is intensely interested in efficient methods of reasoning … but he does not … trouble himself minutely to dissect those parts of this method whose correctness is a matter of course" (4.239).[144] While for the logician, "the greater number of distinct logical steps … will constitute a superiority …

[143] Compare with 1.445, a passage just following the comparison between the mathematician and logician as microscopical: "We can at once see that a pair, having a structure, must present a variety of features; and this is a character in which the dyad differs markedly from the monad, which having no structure nor parts in any sense, is bare of all features except that each *one* is something peculiar."

[144] Peirce's explanation, here, refers to a conversation he had with his father over the differences between a mathematical and a logical approach to algebra.

over another [method] which moves more swiftly to its conclusions. [The logician] demands … a [method that analyzes] reasoning into its *last elementary steps*" (4.239—my emphasis). The logician is thus defined by his particular mode of observation that isolates the elementary units of the propositions composing an aggregate method of reasoning, a mode that can only be understood as microscopical.

Indeed, Peirce makes the connection between logical and microscopical analyses explicit in a section of the "Minute Logic," titled "Of Minute Accuracy," when he breaks from his study to address his audience: "The reader will often think that the writer makes far too much of microscopic distinctions" (2.16). By "microscopic distinctions," Peirce means those "little details of knowledge" that too often "painfully mature" into inaccurately "broad generalizations," resulting in a "crude spirit inciting only broils between a hundred little dogmas" (2.14). And so isolating these "microscopic distinctions," and emphasizing the minute over the aggregate—that is, applying the microscopical function of logic to philosophical questions—becomes Peirce's means to rescue philosophy from its disgraceful state. "[T]he melancholy disintegration of philosophic thought," Peirce continues, is "due to loose reasoning and the aversion to minute analysis" (2.18). Making "too much of microscopic distinctions" is precisely what philosophy and logic must undertake, for if they do not, then those errors introduced at the microscopical level will "become enormously magnified in their effects" (2.16). Logic, then, as a kind of thinking attentive to the minute, the thinking of a "microscopical mind," becomes a corrective tool that locates and solves errors before their unrealized integration within a philosophical system—that is, before they have a chance to corrupt an otherwise solid philosophical edifice.

Errare est humanum*; or, On Making Mistakes*

That Peirce routinely thought of the microscope as a tool of verification is determined easily enough, considering his reliance on it in the countless experiments he conducted for the Survey. It appears as a tool of verification in his 1893 essay, "The Connection Between Mind and Matter," as well. Here, Peirce works through the competing theories of Leibniz's nominalist metaphysics and modern materialistic hypotheses that account for the "mutual action between mind and matter in volition and in sensation" (6.272). He reviews a recently revived theory suggesting that through mental effort "certain material particles can be made temporarily to attract and repel one another" (6.275), and then compares this somewhat fanciful theory against the strong materialist argument. The materialist theory, according to Peirce, has an edge over others, or a "logical advantage," because the materialist, when challenged, "fetches out his microscopes … and endeavors to verify his theory by detecting some histological or chemical facts on which [the challenge] may depend," whereas other theorists can only "attribute [the challenge] to a metaphysical agency out of the realm of verification" (6.275).[145]

However, thinking of the microscope not only as a tool of verification, but as a tool for correction, displays a more significant nuance, one that drives at some of Peirce's strongest philosophical convictions and thus demonstrates how the instrument informs an even wider set of Peircean concepts. Recognizing the microscope as a means of defining the logical mind, particularly as a manner of thinking employed as a corrective, implicates the notion of *error* and the consequences that thinking through the role of making mistakes has on the development of drawing correct conclusions. Peirce had long accepted the adage *Errare est humanum,* and had developed the insight to realize that making errors is fundamental to the advancement of the intellect, and that the closer one comes to a thing, the further away that thing appears to be. Without errors, there could be no doubt, without doubt there would be no impetus to discover the truth.[146] The

[145] Earlier in the essay, Peirce had defined "metaphysics" as the "unverifiable," a definition he attributes to Auguste Comte (See 6.273 and Comte's *System of Positive Polity*, volume I). See also Peirce's unpublished paper collected in volume V of the *Collected Papers* under the title "Consequences of Critical Common-Sensism" (5.505), where he again illustrates the microscope as a tool used to determine the validity of a concept.

[146] Peirce regularly voices the maxim *Humannum est errare*. See, for example, the Preface to *The Principles of Philosophy* (1.9), where he defines scientists as those who have "waked up to" this most fundamental truth, and Lecture No. 4 on "Detached Ideas on Vitally Important Topics" (1898), titled "Causation and Force," where he claims, "It is a truth well worthy of rumination that all the intellectual development of man rests upon the circumstance that all our action is subject to error" (6.86). The second principle indicated above, that the closer one approaches an object, the further away it appears, is an idea I have gathered throughout my readings of Peirce on precision and measurement. For example, in the unpublished manuscript referred to above, "Consequences of Critical Common-Sensism," Peirce asserts,

movements from vagueness to clarity, from question to answer, and from doubt to belief, are shaped by errors, as they parallel the scientific method of proposing the most wildly incredible hypotheses, treating them with respect, and then seeking refutation rather than confirmation. Reasoning is, by necessity, imperfect, always “subject to uncertainty and inexactitude” (1.144); if it were otherwise, thinking would be satisfied, completed, and at rest.[147]

“Even in our most intellectual conceptions, the more we strive to be precise, the more unattainable precision seems” (5.506). And again, when working through the relationship between the irregularity associated with singular events and the regularity assumed by generalized laws of nature—a question he addresses when arguing for the necessity of absolute chance—Peirce stresses, “Try to verify any law of nature, and you will find that the more precise your observations, the more certain they will be to show irregular departures from the law” (6.46). Indeed, Peirce takes this basic assumption as a starting point to the development of many of his ideas regarding science, that certitude is never exact: “… On the whole, then, we cannot in any way reach perfect certitude nor exactitude. We never can be absolutely sure of anything, nor can we with any probability ascertain the exact value of any measure or general ratio” (1.147). Though this insight might appear to contradict the methods generally associated with science, Peirce would argue that only science, as distinguished from metaphysical philosophy or religious dogma, can move forward after accepting the inexact nature of propositions.

For the importance of error in Peirce’s epistemology, see especially “How to Make Our Ideas Clear” and “The Fixation of Belief,” where he replaces the metaphysical categories of “truth” and “falsity” with “belief” and “doubt,” defining “doubt” as instinctive and likening it to hunger. Truth is nothing other than the establishment of a habit, or the fixing of belief, which is driven by skepticism, or the desire to appease the “irritation of doubt,” itself a product of the recognition of error.

[147] Not accounting for the proper role of error is a fundamental problem with most metaphysical thinking, especially those systems that assume *a priori* judgments, which must always be taken “at their own valuation, without criticism or credentials” (1.144); that is, because *a priori* laws are held to be “absolutely certain, without exception and exact” (1.144), they cannot be shaped by errors, and consequently, cannot be reasoned. Such judgments thus “bar the gate of inquiry” as they pretend infallibility. Science, it seems, though also infected by men who refuse or shrink back from this most basic truth (that exactness and universality can never be proven, do not exist, per se) at least moves on even after accepting it. In fact, what makes science preferable is precisely that fallibilism is its only real first principle: “Indeed, it is precisely among men animated by the spirit of science that the doctrine of fallibilism will find supporters” (1.148).

Peirce’s philosophy of error similarly devalues religious thinking, not because he was strictly secular, but because the *a priori* judgments put forward by religious doctrine cannot be reasoned, are not presented as critical or fallible, and are not borne out by error. Peirce criticizes religious thinking on the same grounds as metaphysics; both assume and apply certitude to *a priori* judgments that, when looked at closely, or microscopically, are revealed as mixed up, and dependent on error. He would thus be strictly opposed to the kind of alchemical science as practiced by John Winthrop, Jr., who understood alchemy as a legitimate, multidimensional science motivated primarily by the comprehensive disclosure of God’s plan in order to reshape the world in preparation for the Second Coming. Peirce points out that knowledge of God’s plan is always subject to human “distortion or coloring,” and that it is impossible to know whether or not God “might see fit to inspire his servants with errors” (1.143). Alchemy assumes that knowledge may be comprehensive and exact, while authentic scientific thinking necessarily accepts that we cannot know the general laws of God, and only through a lack of knowledge can reason develop. With comprehensive knowledge, or even the assumption that comprehensive knowledge is attainable, reasoning would be unnecessary and non-instinctual. See especially 1.141ff, “Fallibilism, Continuity, and Evolution.”

The connections between the logical mind and the microscope in regards to the necessity of error, and the even greater necessity of correction, appear in an extended inquiry into a basic question often overlooked by evolutionary theory: how do chance events produce permanent effects? Peirce answers the puzzle by drawing a parallel between the evolution of time and the movement of the intellect, which not only functions microscopically, but requires a type of microscopical thinking to unravel the seeming contradiction:

> It is a truth well worthy of rumination that all the intellectual development of man rests upon the circumstance that all our action is subject to error. *Errare est humanum* is of all commonplaces the most familiar. Inanimate things do not err at all; and the lower animals very little. Instinct is all but unerring; but reason in all vitally important matters is a treacherous guided. This tendency to error, when you put it under the microscope of reflection, is seen to consist of fortuitous variations of our actions in time. But it is apt to escape our attention that on such fortuitous variation our intellect is nourished and grows. For without such fortuitous variation, habit-taking would be impossible; and intellect consists in a plasticity of habit. (6.86)

The case summarized above, that the making of mistakes is a necessary and essential feature of advancing the intellect, is reaffirmed in this passage, as Peirce clarifies the

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In this way, a parallel may be drawn between Peirce's science and the moral of "The Birthmark," the second story composing Nathaniel Hawthorne's *Mosses from an Old Manse*. The story confronts the hubris of Aylmer, a brilliant scientist who wishes to remove a small, hand-shaped birthmark, what he sees as a "defect … being the visible mark of earthly imperfection" (29), from the left cheek of his young wife, Georgiana. Aylmer obsesses over removing the birthmark, administering a variety of agents on his reluctant, yet obedient, wife. He eventually succeeds, but at the peril of inadvertently killing his beloved in the process, whose life force was inseparably attached to the mark. About midway through the story, while Georgiana was unknowingly undergoing Aylmer's experiments, she reads through a "large folio from her husband's own hand, in which he had recorded every experiment of his scientific career" (38). The more she read, the more she reverenced Aylmer, and "loved him more profoundly than ever" (38). However, and this is the key to understanding Hawthorne's acumen in matters of the heart, the narrator qualifies Georgiana's profound love for Aylmer writing, "Much as he had accomplished, she could not but observe that his most splendid successes were almost invariably failures, if compared with the ideal at which he aimed" (38). Georgiana loves Aylmer because of, not despite, his failures; she does not want perfection, she wants a human, and thus her love for Aylmer is dependent on the most fundamental aspect of human nature: to err. Aylmer, by seeking purity and perfection, misses the nature of love as essentially borne out of error, he "rejects the best that earth could offer," by creating, and ultimately killing, a "now perfect woman" (43).

The insight, here, is that there can be no love without defects, imperfections, and errors; in fact love is an admission of imperfection as it admits need, dissatisfaction with one's self, and the desire to find satisfaction with another. If one was perfect or infallible, that is, if one did not commit errors, one would not feel this impulse to love, to be completed, or to be forgiven. Just as the intellect depends on error to advance, one might say the heart depends on error to find fulfillment with another.

nourishment of the intellect as shaped by the tendency to error. But the movement of the intellect, dependent as it is on error, is something generally overlooked by scientists and philosophers alike, who assume that, just as chance cannot beget permanence, error cannot beget truth. What it takes to clarify the conundrum is a "microscopical mind," a mind that "reflects microscopically," and when this logical, microscopical mind magnifies the contradiction, we see that no such contradiction exists, that the contradiction is merely a misapprehension generated by hastily accepting the whole without first clarifying the particulars. The passage thus not only exemplifies Peirce's regular characterization of the mind as best understood through reference to the microscope, but also suggests that the purpose of applying the microscopical mind is to unravel and correct contradictions through clarifications of particulars, rather than seeking contradictions and stopping there, a habit Peirce associates with the bad logic of Hegelianism.[148]

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[148] Peirce's opinion of Hegel was without doubt ambivalent. At times, he emphatically displays his appreciation of Hegel, such as in an unidentified fragment concluding "Lessons from the History of Philosophy," where he writes, "My philosophy resuscitates Hegel, though in a strange costume" (1.42). Many times, he treats Hegel with respect, considering his own work as minor corrections to Hegel's otherwise admirable logical foundations:

> Now the question arises, what necessarily resulted from the state of things? But the only sane answer is that where freedom was boundless nothing in particular necessarily resulted … In this proposition lies the prime difference between my objective logic and that of Hegel. He says, if there is any sense in philosophy at all, the whole universe and every feature of it, however minute, is rational, and was constrained to be as it is by the logic of events, so that there is no principle of action in the universe but reason. But I reply, this line of thought, though it begins rightly, is not exact. A logical slip is committed; and the conclusion reached is manifestly at variance with observation. It is true that the whole universe and every feature of it must be regarded as rational, that is as brought about by the logic of events. But it does not follow that it is *constrained* to be as it is by the logic of events; for the logic of evolution and of life need not be supposed to be of that wooden kind that absolutely constrains a given conclusion. (6.218)

Peirce routinely faults Hegel for the his inability to fully recognize the ontology of each Universal Category, as he dwells completely in the Category of Thirdness, though he is quick to point out that even Hegel "does not appear to recognize it" (5.79). He believes that "the doctrine of Hegel is to be commended" for his ability to detail the Category of Thirdness, but emphasizes the negative consequences that this doctrine must result in when composing a true logic, one not constrained by and reducible to deduction.

However, though Peirce did once view his philosophy as a "resuscitation of Hegel," other passages espouse a decidedly negative opinion, such as in "A Guess at the Riddle," where he declares:

> My whole method will be found to be in profound contrast with that of Hegel; I reject his philosophy *in toto*. Nevertheless, I have a certain sympathy with it, and fancy that if its author had only noticed a very few circumstances he would himself have been led to revolutionize his system. One of these is the double division or dichotomy of the second idea of the triad. He has usually overlooked external Secondness, altogether. In other words, he has committed the trifling

Peirce distrusted any metaphysical system that held the principle of contradiction as its standard; he regularly criticized Hegel and his Hegelian contemporaries for

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> oversight of forgetting that there is a real world with real actions and reactions. Rather a serious oversight that. Then Hegel had the misfortune to be unusually deficient in mathematics … Hegel's dialectical method is only a feeble and rudimentary application of the principles of the calculus to metaphysics. (1.368)

Peirce's opinion on Hegel is evident, here. Though he begins congratulatory enough, indicating his "Hegelian sympathies," his summation of the Dialectic quickly becomes sarcastic and acerbic, poking fun at Hegel's deficiencies in mathematics and what Peirce sees as Hegel's obliviousness to the "real world." Peirce's opinion does not change much in the thirteen year interim between "A Guess at the Riddle" and the "Lowell Lectures of 1903," where he bluntly complains, "Hegel's method has the defect of not working at all if you think with too great exactitude" (1.544), or just earlier in the manuscripts for the uncompleted *History of Science* (1896), where he describes Hegel's "Historic Method" as one that "studies complex problems in all their complexity, but which cannot boast any distinguished successes" (1.62). Later in the manuscript pages, Peirce's bitterness towards Hegel takes on a different nuance, as he criticizes the Hegelian influence that erected and reified an "official standard of truth" and that "frowned on all who questioned it." Thus, institutions, particularly German universities, "for a whole generation turned the cold shoulder to every man who did not extol their stale Hegelianism, until it became a stench in the nostrils of every man of common sense." Ultimately, Peirce uses the varying trends of Hegelianism to exemplify the trajectory of universities towards purposes of "the fitting of a selection of young men to earn more money than their fellow citizens not so favored," rather than towards the proper and honorable purpose of the university, which is the "solution of great problems" (1.77).

Peirce's sympathies with Hegel are borne out of their shared agreement with that most nagging of philosophical first principles: that the world is in a state of perpetual flux. As such, Peirce makes a case, aimed primarily at philosophers working out of religious traditions, who too hastily disparage science, that Hegelian metaphysics has much more in common with mathematicians and physicists than one might think:

> So shut up are [religionists] in this [theological] conception of the world that when the seminarist Hegel discovered that the universe is everywhere permeated with continuous growth (for that, and nothing else, is the "Secret of Hegel") it was supposed to be an entirely new idea, a century and a half after the differential calculus had been in working order … Hegel, while regarding scientific men with disdain, has for his chief topic the importance of continuity, which was the very idea the mathematicians and physicists had been chiefly engaged in following out for three centuries. This made Hegel's work less correct and excellent in itself than it might have been; and at the same time hid its true affinity with the scientific thought into which the life of the race had been chiefly laid up. It was a misfortune for Hegelism [*sic*], a misfortune for "philosophy," and a misfortune (in lesser degree) for science. (1.40-1)

While Peirce is thus routinely critical, and at times disrespectful, of Hegelian thought, he concedes to a grander purpose for which both he and Hegel owe their successes. Both projects are committed to the conception of a lawful yet ever mutable universe of potentiality that nonetheless tends towards the fulfillment of discernible general laws by means of an active human consciousness that realistically corresponds with the world. He resists accepting the Dialectic on the grounds that its primary logical method of contradiction and deduction denies the many logical variations through which reason may function. He likes "refutation" better because of its scientific connotations, and tends to view "contradiction" as metaphysical and unverifiable; that is, "contradiction" too often means "inscrutable," or, as he moralizes in an unpaginated manuscript included under "Notes on Scientific Inquiry," "maintaining that this, that, and the other never can be known" serves as a "bar which philosophers often set up across the roadway of inquiry" (1.138). These passages cited above and those lacing the *Collected Papers* expose Peirce's continual struggle with Hegel as a thinker, one who had as profound an influence on his work as any other.

neglecting to update what he sees as an outmoded and simplistic method of reasoning. "The principle of contradiction," Peirce argues in "A Guess at the Riddle," "is a shibboleth for such minds; to disprove a proposition they will always try to prove there lurks a contradiction in it, notwithstanding that it may be as clear and comprehensible as the day" (1.360). He calls such philosophers "contradiction-mongers," defining them as products of seminarian and dogmatic thinking. He faults Josiah Royce on these grounds, writing, "Dr. Royce cannot free himself from the Hegelian notion that the one satisfactory method in philosophy is to examine an opinion and to detect in it some hidden denial of itself,—which is nothing but the *reductio ad absurdum.*" "Such refutations in metaphysics," Peirce continues, "are most frequently downright fallacies due to the loose habits of thinking prevalent in the theological seminaries," the habits marking "Prof. Royce's greatest fault as a philosophical thinker" (8.110). The microscopical mind, then, is one that refuses to accept contradiction as a logical conclusion; employing the "mental microscope" means resisting the urge to "reconcile" contradictions by folding them into a "superphenomenal" metaphysical system. And Peirce does just this when taking on the question of the relation between mind and matter.[149] He locates a contradiction that emerges when those who argue that the "law of dynamics is never violated" confront those who argue that the "law of mind is never violated" (7.368). Psychophysical parallelism was thought to reconcile this impasse, but Peirce finds the theory to falsely stop at the value of contradiction itself. Instead of preferring one side to the other, or accepting both as naturally irreconcilable, Peirce offers a third option:

> There is, however, a third objection which seems to knock the ground from under it, once and for all; and this is that the two propositions which are supposed to be in contradiction with one another, unless metaphysics is brought in to reconcile them in a superphenomenal manner, can, in fact, be seen to be not in the least in

[149] The discussion I refer to here may be found in the manuscripts of the "Minute Logic" (Section 1 "Classification of the Sciences," chapter two "Pre-logical Notions") compiled under the title "Psychognosy" (7.362ff).

> conflict with one another, if we scrutinize them with a logical microscope. (7.368)[150]

My purpose, here, is not to decide whether Peirce's conclusion regarding the mind/matter dilemma is successful, but to uncover his method of approach, which employs a logical mind defined by the microscope, and thus suggests a manner of thinking construed by the instrument. Peirce reaches the opinion that contradictions are nothing other than the results of a failure to discern the components brought into conflict, and that one can correct the error prior to its integration, and eventual corruption, of a solid philosophical edifice, by taking a microscopical view, a view that "isolates the particulars" composing the conflict. The error corrected here is the "dual divisions of logic" that "result from a false way of looking at things absolutely" (1.354).[151] The essay where Peirce most adamantly works through the necessity of clarifying conceptions, extracting them from the "rich mud" of contradictions and self-denials, and the misapplication of metaphysical terminology like "truth" and "falsity," is the famous "How to Make Our Ideas Clear," an essay written about phenomena as "they appear under a mental microscope" (5.394). The "mental" or "logical" microscope thus represents a distinctly non-contradictory/non-metaphysical approach to philosophical questions.

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[150] The doctrine of psychophysical parallelism was hotly debated throughout the nineteenth century as a possible solution to the mind-body problem that had motivated much early modern philosophy. Spinoza, Leibniz, Malebranche, and others all put forth theories that could be considered variations of psychophysical parallelism. The doctrine, in brief, marks a way of avoiding the problem of causal interaction between mind and body by proposing the dominance of one to the other, or the pre-ordainment of God who had created two separate realms running side-by-side.

[151] See also 2.420, where Peirce similarly works out how a concept commonly considered contradictory may be understood as non-contradictory by taking a closer look at its component parts. In this section of "Upon Logical Comprehension and Extension," Peirce discusses the "breadth" and "depth" of a symbol:

> If we learn that S is P, then, as a general rule, the depth of S is increased without any decrease of breadth, and the breadth of P is increased without any decrease of depth. Either increase may be *certain* or *doubtful* … It may be the case that either or both of these increases does not take place. If P is a negative term, it may have no depth, and therefore adds nothing to the depth of S. If S is a particular term, it may have no breadth, and then adds nothing to the breadth of P. This latter case often occurs in metaphysics, and, on account of not-P as well as P being predicated of S, gives rise to an appearance of contradiction where there really is none; for, as a contradiction consists in giving to contradictory terms some breadth in common, it follows that, if the common subject of which they are predicated has no real breadth, there is only a verbal, and not a real contradiction. It is not really contradictory, for example, to say that a boundary is both within and without what it bounds. (2.420)

Minute logic clarifies concepts by focusing on their particular components. As such, it names the manner of reasoning borne out of the microscopical mode of viewing, as it emphasizes discernment of particulars prior to acceptance of an integrated, aggregate whole. Peirce's "logic of relatives," what is, perhaps, his most influential contribution to the field, was motivated by the same impulses described above, as a means of correcting reasoning by embracing a microscopical mode of vision.[152] He defines relative logic in an entry submitted to James Mark Baldwin's *Dictionary of Philosophy and Psychology*, writing, "Deductive logic can really not be understood without the study of the logic of relatives, which corrects innumerable serious errors into which not merely logicians, but people who never opened a logic-book, fall from confining their attention to non-relative logic" (3.641). He describes a few of the most "serious errors" before turning his attention to Kant, who presumes that "deduction only elicits what was implicitly thought in the premisses [*sic*]," the primary support of Kant's "famous distinction of analytical and synthetical judgments." Briefly put, Kant reduces all reasoning to the syllogistic form called *Barbara*, represented by the common example: All men are mortal, Socrates is a man, therefore Socrates is mortal. Peirce denies this three-step framework, arguing that "inference itself is discovered by the *microscope of relatives* to be resolvable into more than half a dozen distinct steps," thus demonstrating how "[m]atter entirely foreign to the premisses [*sic*] may appear in the conclusion" (3.641—my emphasis). Peirce thus likens relative logic to the microscope, characterizing it as a particular method of scrutiny that not only clarifies and corrects established logical forms, but reveals matter that could not be discerned prior to its microscopical employment.

These examples, of the "logical microscope," the "mental microscope, "the microscope of reflection," and the "microscope of relatives," present both a set of passages displaying how Peirce understood the microscopical functioning of logic, as well as how the microscope itself becomes defined when used in this philosophical/scientific context. The chief feature characterizing relative logic is the same

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[152] Peirce considered his "logic of relatives" as the mode of reasoning most suited to his categories of Firstness, Secondness, and Thirdness, and that might for the groundwork of a scientific language comprised of terms from each. For a brief synopsis of Peirce's categories, and how they lead to the logic of relatives, see Mike Linzey, "On the Secondness of Architectural Intuition."

implied in his distinction between the logician and the mathematician: the logician *dissects* a concept to distinguish both the greatest number of minute particulars composing it and the elementary moves taken in properly reasoning through it. To clarify concepts, the logician, like the microscopist, must “isolate the particulars.” Herein lies the break with Emerson, who, we remember, demands the observer to “integrate the particulars” (*JMN* 4:288-99). “Isolating the particular” requires a different manner of engagement, one that shifts vision from the presbyopic to the myopic, from the aggregate to the particular.[153] Not only did the microscope make possible the thinking of scientific classifications in terms of their relative and unique modes of observation, but also made possible a way of connecting this mode of observation with a method of approach to philosophical questions, a way of thinking about logic as conducive to the microscopical, as a process that picks sensible things and concepts to pieces. This approach that Peirce is after is precisely that which Emerson resisted: to use microscopes is to *dissect*.

The Spirit of Dissection

As outlined in the Introduction, this project entails discerning the epistemological formulations that the microscope preserves, the impulses that are “still hidden” in the instrument and that are reformulated in the information it conveys. Thus far the process of dissection has emerged as one of the microscope’s most significant preserved impulses. The microscope might be considered as the instrumental manifestation of dissection, witnessed both in the physical extraction of an object—the cutting up of bodily pieces placed on the slide—and in the observation it produces, the organizing of sense perception into dissected levels of magnification; it preserves and encourages the spirit of dissection as it too is fostered by the impulse to isolate the particular.

I have demonstrated how firmly Peirce associates the mind with the operations of microscopy. Pursuing this connection, I argue that to describe the mind as microscopical is to say that it performs dissection. Peirce’s enthusiasm for the microscope, his manner of routinely employing it to characterize and determine his philosophical positions, brings

[153] Or, from what Peirce calls “seminary-philosophy” to “laboratory-philosophy” (1.129).

to the fore this spirit of dissection embodied in the instrument, demanding further analysis of how this impulse permeates his work. The reason why the microscope tends to be classified as a "scientific" instrument, though it doubtlessly provoked reconsiderations of questions properly "philosophical," is likely because the disciplines of philosophy, at least until the twentieth century, traditionally suppressed dissection to construct a program of knowing that privileges the whole over the particular, general/universal laws over spontaneous discrepancies (the ill-fitting of particulars composing those laws), metaphysical registers of truth and falsity over doubt and belief, and logical deduction over diverse manners of reasoning. Just as the microscope takes on an increasingly greater significance in Peirce's thought, so too does the process of dissection, as it speaks to his understanding of logic and the stating of propositions, the functioning of the mind, the creation of a philosophical method appropriate to modern science, and, most importantly, the working through of the whole/particular dialectic. Peirce most confidently traces his philosophical lineage to Aristotle, and he does so by means of their shared confidence in the value of dissection.

Peirce addresses this suppressed history of dissection in "Philosophy and the Conduct of Life."[154] He opens the lecture by summarizing recent historical accounts of the amusing curiosities regularly associated with early Greek philosophers: the story of Thales falling into the ditch while pointing out different stars; Democritus always laughing; Heraclitus always weeping. Whether or not these stories are true appear to hold great weight with Peirce's contemporaries, less so for Peirce himself; for what these stories suggest, independent of their actually having occurred, is the "kind of man the narrators expected a philosopher to be" (1.618).[155] The lesson Peirce draws from this collection of narrators—Plato, Aristotle, Cicero, Seneca, Pliny, Plutarch, Lucian, and Ælian, men he calls the "sanest and soberest minds of antiquity"—is that for the Greeks, philosophy was expected to affect life, not by "any slow process of percolation of forms," but "forthwith in the person and soul of the philosopher himself, rendering him different

[154] "Philosophy and the Conduct of Life" is the title of Peirce's first lecture on "Detached Ideas on Vitally Important Topics" delivered in 1898.

[155] By "narrators," Peirce refers to those sources through which these stories were preserved.

from ordinary men in his views of right conduct" (1.618). Philosophy was not to be separated from aesthetic and moral culture. Plato's study of the Dialectic, for example, has everything to do with virtuous living; when Socrates "put his feet on the ground" (*Phaedo* 61d), we are reminded of the practical necessities which philosophy ought to serve, a grounding in the physical, living world. The principles of strife and change made Heraclitus weep; the pursuit of pleasure made Democritus laugh. And so this link between philosophy and practice manifests as semi-biographical eccentricities.

However, Peirce sees something different in Aristotle. This Greek philosopher was, according to Peirce, "not much of Greek;" he was likely not full-blooded Greek, nor was he "altogether Greek-minded" (1.618), and he probably had little contact with Plato during his first few years in Athens, arriving already as a student of Democritus, a Thracian. But above all, what separates Aristotle from early Greek thinking, and from those narrators who espoused the attitude that philosophy and practice are one, is that Aristotle was an Asclepiades, meaning that "he belonged to a line every man of whom since the heroic age had, as a child, received a finished training in the *dissecting-room*" (1.618—my emphasis).[156]

Peirce reads Aristotle's Asclepiadic training as the cause of his "thorough-paced" scientific instincts, his ability to classify knowledge into different intellectual departments, and his willingness to operate. Training in dissection applies not only to the cutting of sensible objects, but also to philosophical premises and conceptions, and thus equipped Aristotle to correct the error that philosophy and practice are inseparable. Peirce

[156] Asclepiades refers to the cult of Æsclepius, the Greek god of medicine and of the Greek physicians. Members of this cult were especially famous for their surgical skill (see Alice Walton, *Asklepios: The Cult of the Greek God of Medicine*). Æsclepius is also known as the god Socrates names just before drinking the hemlock in the *Phaedo*; his famous last words being, "Crito, we owe a cock to Asclepius; make this offering to him and do not forget" (118a).

Aristotle's father, Nicomachus, was a physician who, according to biographer John Gillies Aristotle, "derived his descent, through a long line of medical ancestors, from Æsculapius, the companion of the Argonauts, whose skill in the healing art had raised him to a seat among the gods" (18). Peirce is clearly correct when referring to Aristotle's training in dissection, as nearly any of his zoological or anatomical treatises display. Besides extant works like *On the Parts of Animals* (*De Partibus Animalium*), *On the History of Animals* (*Historia Animalium*), *Motions of Animals* (*De Motu Animalium*), and *On the Soul* (*De Anima*), each of which contain numerous illustrations of anatomical knowledge obtained by dissection, Aristotle frequently refers to a lost treatise he titled *The Dissections*. See A.L. Peck's translator's note to Aristotle's *Historia Animalium* 73.

highlights Aristotle's descent from Asclepius both to stress his own philosophical lineage—as he confesses to his audience, "in this respect [i.e. dissection] I stand before you an Aristotelian and a scientific man" (1.618)[157]—and to define his opinion on the then present condition of philosophy, which needs correcting in the same manner:

> In my opinion, the present infantile condition of philosophy … is due to the fact that during this century it has chiefly been pursued by men who have not been nurtured in *dissecting-rooms* … and who consequently have not been animated by the true scientific *Eros*; but who have on the contrary come from theological seminaries, and have consequently been inflamed with a desire to amend the lives of themselves and others, a spirit no doubt more important than the love of science … but radically unfitting them for the task of scientific investigation. (1.620)

Peirce thus calls for philosophers to bring the process of dissection to bear on inquiry, a process that might rescue philosophy from its seminarian tendencies. The philosophical type Peirce has in mind is Emerson, who clearly works out of a theological tradition and who, on the topic of dissection, displays a stark contrast with the passage cited above:

> Let it be a point as before. Integrate the particulars. We have no Theory of animated Nature. When we have, it will be itself the true Classification. Perhaps a study of the cattle on the mountainside as they graze, is more suggestive of truth than the inspection of their parts in the dissection-room. (*JMN* 4:288-9)

Dissection, like microscopy, marks a procedure of analysis that isolates the particular. Emerson saw the microscope as cultivating this habit of isolation and criticizes it as such; Peirce sees the same and applauds it.

A few years later, Peirce will renew the conversation regarding the Greek aversion to dissection. In the "Minute Logic," he directly links the resistance to dissection with the resistance to minute analysis, which, we remember, is the reason he gives for "the melancholy disintegration of philosophic thought" (2.18):

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[157] Peirce's complete "confession" appears as follows:

> Now, Gentlemen, it behooves me, at the outset of this course, to confess to you that in this respect I stand before you an Aristotelian and a scientific man, condemning with the whole strength of conviction the Hellenic tendency to mingle philosophy and practice. (1.618)

I am certainly not advocating for the separation of philosophy from practice. I am merely pointing out that Peirce does, and that his position is one cultured by his enthusiasm for dissection that I believe informs his enthusiasm for microscopy.

> The Greek philosophers could not be persuaded that minute analysis was proper in physical science. Born Hegelian sensualists, they could not divest themselves of their belief that no worse way of getting at any comprehension of a flower could be devised than beginning by picking it to pieces, and so spoiling the flower. What was the result? Manifold have been the theories that have been successively offered, considered, and rejected, to account for the non-success of the Greeks in physics. That the vast intellect of an Aristotle, so great in zoölogy, in the science of politics, in rhetoric, in the history of philosophy; so gigantic in ethics, logic, metaphysics, and psychology, should, in physics, have sunk into abject inferiority to the cranks of modern times, the refuters of Newton, the proposers of perpetual motions, has hitherto not been adequately explained. What better account of the matter could one desire than that in physics the Hellenic element of Aristotle's nature—that Greek estheticism which forbade analysis and required that the phenomenon should be contemplated in its concreteness—here governed him? That this was the cause is shown by the fact that all the other Greeks who shared the same prejudice were equally unsuccessful; while the few who did not share it, Hipparchus, Eratosthenes, Posidonius, Ptolemy, Archimedes, were eminently successful in the physical sciences. In zoölogy, Asclepiad Aristotle, scion of a family whose every member, from the further prehistoric times, had been trained in medicine from childhood up, shared no Hellenic repugnance to dissection. Nor did that repugnance ever extend to the non-sensuous objects with which Aristotle dealt in the sciences in which he most excelled. (2.11)

Peirce thus offers a speculative history of Greek thought centered on dissection. He argues that the defining feature of Hellenic thinking is the privileging of the whole to the particular, which accordingly institutes a prejudice against the kind of minute analysis sought through dissection. Even Asclepiad Aristotle is not completely free from the "Hellenic repugnance to dissection," as it governed and rendered unsuccessful his thoughts on physics, even to the standards set by "cranks of modern times."[158] Dissection, then, becomes the fulcrum on which Peirce's evaluation rests: Aristotle's techniques of dissection prove him authoritative in those fields in which he employs them and inferior in those fields where he succumbs to this Hellenic "nature." Uncovering this history is,

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[158] Peirce also refers to Aristotle as an "Asclepiad" in one of his many contributions to James Mark Baldwin's *Dictionary of Philosophy and Psychology*. In his entry for "Matter and Form," he writes, "It must not be forgotten that Aristotle was an Asclepiad, that is, that he belonged to a family which for generation after generation, from prehistoric times, had had their attention turned to vital phenomena; and his is almost as remarkable for his capacity as a naturalist as he is for his incapacity in physics and mathematics" (qtd. in 6.356). Peirce uses Aristotle's upbringing to help define the "Aristotelian distinction" between matter and form. See James Mark Baldwin, *Dictionary of Philosophy and Psychology, vol. II* 50-5.

for Peirce, equally motivated by his opposition to Hegel, a figure he regularly criticizes for both his imprecision and his "forgetting that there is a real world with real actions and reactions" (1.368), a world of particular case-by-case events that challenge their sublation into a comprehensive whole. His inclusion of Hegel not only displays his disagreement—that Hegelians cannot comprehend, and therefore sacrifice, the particular to uphold an unrealistic notion of the whole—but also the extent to which this feature of early Greek thinking has influenced the development of philosophy: the "Hellenic repugnance to dissection" is still preserved even in the metaphysics dominating Peirce's age.[159] It manifests as the aversion to minute analysis in logic and philosophy, which leads not only to the "melancholy disintegration of philosophical thought," but to the prejudiced dismissal of the minute particular in favor of the whole.

The resistance to dissection defined by early Greek thinking is also felt in Peirce's rationale for the traditional privileging of deductive logic in metaphysics. Like Nietzsche, Peirce identifies Thales as the first voice of Western philosophy, and would agree that his "seemingly absurd" proposition, that "*water* is the primal origin and the womb of all things," marks the instant where a statement concerning the origin of things is made with

[159] Another moment where Peirce employs the idea of dissection appears in the second of a three essay series on pragmatism, published in *The Monist* between 1905 and 1906. In the first essay, "What Pragmatism Is," (vol. 15, 161-81, 1905) Peirce accuses the deplorable state of philosophical nomenclature of impeding those who are "intent upon rescuing [the discipline] and bringing it to a condition like that of the natural sciences" (5.413). He voices a similar complaint in *The Monist* in the following volume ("Mr. Peterson's Proposed Discussion," vol. 16, 147-51, 1906) in response to James B. Peterson's article "Some Philosophical Terms," also published in *The Monist* (vol. 15, 629-33, 1905). Here Peirce contends,

> [I]n order that philosophy should become a successful science, it must, like biology, have its own vocabulary; and as in biology, it must be the rule that whoever wishes to introduce a new concept is to invent a new word to express it … I am, for my humble part, maturely convinced that philosophy will never be upon the road to sound results until we dismiss our affection for old words and our dislike of newfangled words, and make its vocabulary over after the fashion of taxonomic zoölogy and botany. (qtd. in 5.612)

In the second essay of the series, "Issues of Pragmatism" (vol. 15, 481-99, 1905), Peirce provides an example of how philosophy might begin reconstructing its nomenclature, and does so in a way that references dissection. After detailing the variant forms of the term "precise," Peirce concludes, "[i]f we desire to rescue the good ship Philosophy for the service of Science from the hands of lawless rovers of the sea of literature, we shall do well to keep prescind, presciss, prescission, and prescissive on the one hand, to refer to *dissection* in hypothesis, while precide, precise, precision, and precisive are used so as to refer exclusively to an expression of determination which is made either full or free for the interpreter" (qtd. in 5.449—my emphasis). The verb *to prescind*, a term created "with salutary boldness" by "older logicians," is especially important to Peirce because of its correspondence to the "Latin word meaning only to 'cut off at the end'" (qtd. in 5.449), further suggesting how significant it was for Peirce to resuscitate and apply the foregone notion of dissection in his attempt of "rescuing philosophy."

language devoid of superstition or religious fable, while proposing, if only embryonically, the philosophical concept that "all things are one" (*Philosophy in the Tragic Age of the Greeks* 38-9). Peirce adds that discovery of a "primal matter out of which the world is made" (1.373) was the chief concern of the Ionian philosophers. This original insight thus moved the Ionians to seek explanation by first assuming that where variety exists, a homogenous "something," a primal "matter," must beget the heterogeneity observed in nature. Their idea was, he explains, "that they could not tell how the world was formed unless they knew from what to begin their account" (1.373), leading them to deduce the variety of nature from an indeterminate beginning, the *άρχή*. The narrative suggests to Peirce that "[t]he inductive [method] of explaining phenomena by tracing them back step by step to their causes was foreign not only to them but to all ancient and medieval philosophy" (1.373). The process of dissection, then, appears to challenge deductive methods, as its aim is to understand the whole from out of the parts—"spoiling the flower" by picking it to pieces—and tracing back the steps to the origin.

But the spin Peirce works here, on how the method of dissection and its consequent logic of induction concerns comprehension of phenomena, emerges not as an ontological qualification of the phenomenon in question, but as the operation enacted by the understanding in its cognition of that phenomenon. That is, phenomena are not necessarily presented to the mind as consisting of parts, of which the mind later puts together, or "synthesizes" as Kant argues, but are initially presented to the understanding as complete. Peirce's correction of Kant on this matter appears in "A Guess at the Riddle" in the following passage:

> Kant gives the erroneous view that ideas are presented separated and then thought together by the mind. This is his doctrine that a mental synthesis precedes every analysis. What really happens is that something is presented which in itself has no parts, but which nevertheless is analyzed by the mind, that is to say, its having parts consists in this, that the mind afterward recognizes those parts in it. Those partial ideas are really not in the first idea, in itself, though they are separated out from it. It is a case of destructive distillation. When, having thus separated them, we think over them, we are carried in spite of ourselves from one thought to another, and therein lies the first real synthesis. (1.384)

"Destructive distillation" names a form of dissection, the extraction and separation of particulars from a given whole. And so Peirce defines cognition as a mental operation in which the mind performs dissection; the way we relate to and come to know the world is through dissection of the ideas that the world presents to us. Peirce thus agrees with Kant that the mind "operates" on the world, as opposed to those in favor of the *tabula rasa* (1.374), but adds that the operation is surgical in nature.[160]

Peirce's account of Ionian and Hellenic philosophy exhibits an attempt to establish a history of ideas, which itself amounts to a way of thinking that he believes is most virtuously undertaken by Asclepiads, philosophers informed by training in the dissection-room. In "Logic and Spiritualism," Peirce illustrates the spirit of philosophical dissection by means of a somewhat graphic metaphor.[161] The essay is ostensibly about the place of seemingly unscientific experiences—mind-reading, hypnotism, telepathy, apparitions, clairvoyance, etc.—within the field of scientific experimentation. Whether spiritualist phenomena like these may be proven true or false is less important than is the recognition that these ideas have without doubt influenced opinion. As such, the "sole hope of contributing anything useful to the discussion" lies in breathing into it a novel, candid, direct, and impartial spirit, one that "looks upon speculative opinions as so many objects of natural history" (6.558). This new historian of ideas must employ dissection, by laying "speculative opinions"

> upon his dissection-table as things not calling for sympathy, as vivisection-subjects whose vehement logic-squirmings need excite no concern whatever—that this reader may be aided in picking to pieces, disentangling, studying, the intellectual component impulses urgent to the opinion in hand, in appreciating them, in considering their just limits of action, not so much himself to form definitive judgment *pro* or *con* … as to assign it schematic place in the natural history of opinion. (6.558)

Picking to pieces the component parts of ideas is no different from picking to pieces the component parts of objects upon the dissection-table. The true scientist must not demur

[160] I should add that this discussion appears in "A Guess at the Riddle" wherein Peirce qualifies his use of the triad in determining both the Universal Categories of being and their corresponding Categories of Consciousness; that is, Peirce has already "dissected" the categories to avoid what he calls a "false way of looking at things absolutely" (1.354).

[161] "Logic and Spiritualism" was initially intended for publication in *The Forum* (1905).

from challenging long-held and cherished beliefs, no matter how distressing the "squirmings" consequent of dissection may be. In addition, the scientist must not be limited by the motivation of forming definitive judgments; this aim would influence the process as an ulterior motive, which Peirce regularly defines as blocking the way of inquiry and corrupting the pure drive for truth.[162] And so Peirce's return to Aristotle the Asclepiad is just as much his call for a new spirit of philosophical inquiry, one that treats of philosophical questions as objects for scientific experimentation, as it challenges the traditional resistance to dissection. Pulling apart the pieces leads to a better understanding of phenomena, a way of thinking that best represents the functioning of cognition and has been too long held in check by traditional metaphysics; philosophers must be willing to put their ideas "on the dissection table."

This spirit of dissection pervades Peirce's thinking. It is felt in his distinction of the logician, who "dissects" methods, objects, and concepts to reveal "the greater number of distinct logical steps" (4.239). It becomes methodological when he employs it to understand the nature of propositions; his definition of "Negation," for example, begins with the comment, "[i]n order to trace these relations between propositions, it is necessary to dissect the propositions to a certain extent" (2.379). It is displayed in his regular use of graphs and diagrams, the justification of which echoes his characterization of the logician: "the whole effort has been to dissect the operations of inference into as many distinct steps as possible" (4.424). Dissection names a process representative of microscopical vision, resulting in an extreme emphasis of the minute particular, the value of inductive logic, and a challenge to metaphysical systems borne out of the early Greek tradition that granted privilege to conceptions of the whole. In this discourse concerning dissection, the particular/whole dialectic becomes most relevant as it becomes increasingly significant for Peirce.[163]

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[162] See 1.44-5 and endnote 112 above.

[163] The process of dissection as revealed by these examples will be further investigated below in the discussion of how the microscope informs Peirce's semiology and approach to a philosophy of language. Dissection defines his logical method of striking out pieces of propositions, assertions, and predicates which likewise informs his dissection of the sign. See 6.363 for an example of Peirce dissecting a proposition.

Peirce's position concerning the relationship between the particular and the whole might be best introduced by means of an example he employs to illustrate J.S. Mill's point that "the history of science teems with inconceivabilities which have been conquered" (2.29).[164] One such "inconceivability" conquered by science is Euclid's famous axiom: "a whole is greater than its part." "For two millennia and more," Peirce declares, "this axiom was held to fulfill the ideal of an axiom better than any other, and when men wanted an example of an indubitable axiom, they commonly chose this." For nearly 2200 years, "millions of men" continually declared it "inconceivable that a part should be as great as a whole" (2.30). However, near the end of the nineteenth century, George Cantor, using the idea of a one-to-one correspondence of partial integers to all integers, came to a contrary conclusion that Peirce paraphrases:

> The even numbers are a part only of all the integer numbers. But every whole number has a double which is the double of no other integer number. So, for every integer number there is a separate and distinct double; and thus the doubles are as many as the integer numbers. But these doubles are all even numbers; and so, the partial collection is as great as the whole collection. (2.30)

This example suggests three aspects of the particular/whole dialectic guiding Peirce's eventual complication of it: firstly, it displays that conceptions of the whole have traditionally been privileged to that of the particular—that Euclid's mathematical axiom, which played as large a role in the formation of Western metaphysics as did Thales, Pythagoras, and Plato (1.130), had dominated the discipline for "two millennia and more;" secondly, it demonstrates that Peirce's motivation to rethink the question is one stimulated by science as a mode of engagement defined by challenging long-held conceptions—as he puts it in the *History of Science*, "the scientific spirit requires a man to be at all times ready to dump his whole cartload of beliefs, the moment experience is against them" (1.55); finally, Peirce's rethinking of the relationship is directed towards

[164] John Stuart Mill's statement may be found in his 1865 work *An Examination of Sir William Hamilton's Philosophy,* chapter nine, titled "Of the Interpretation of Consciousness." By quoting Mill on the nature of science to "conquer inconceivabilities," Peirce likely has in mind the argument he put forth in the unpaginated manuscript called "The First Rule of Reason," c. 1899, cited above. Here, Peirce points out that the history of science is replete with instances in which something seemingly unknowable, like the chemical composition of stars, is ascertained; in this specific case, the matter was decided through the development of the spectroscope (see 1.135ff).

"balance" rather than "replacement," as his paraphrase of Cantor says that the partial collection is "as great as," and not "greater than," the whole collection. Peirce's point is that to emphasize one side over the other results in an incomplete view. While my argument thus far might lead one to expect a complete reversal of values—and I do think he becomes increasingly frustrated with the traditional privileging of the whole and its complicit presbyopic vision—such a reversal is not definite in Peirce. Ultimately, the most responsible way of determining Peirce's position regarding the particular/whole dialectic is to recognize that even when he is critical of the conventional attitude favoring the whole, his aim is to investigate both standpoints as equally real and as non-contradictory. That is, contradiction only emerges when one prefers one side to the other; Peirce prefers reciprocity.

When he revives the question of the particular and the whole in "A Detailed Classification of the Sciences," he again employs the process of dissection as illustrative, suggesting that the question's stagnant state results from lack of training in the dissection-room.[165] Considering his admiration for Aristotle, specifically pertaining to the Asclepiadic context, it makes sense that Peirce would revise the particular/whole question by rephrasing it in the Aristotelian terms of efficient and final causation.[166] Briefly put, final causation names the end of a thing's coming-to-be, that "for the sake of which a thing is done" (*Metaphysics* 1013a33), the idea of an event signified by its completion "irrespective of any compulsion for it to come about in this or that particular way" (1.211). Final causation names the general character of a thing, but not the way it comes about; as such, it also names the relation of law to the action or force of a thing. Final causation is oftentimes thought of as "purpose," but Peirce argues that "purpose" is merely a "form of final cause which is most familiar to our experience" (1.211). Efficient causation, on the other hand, refers to the "compulsion determined by the particular condition of things" (1.212). Efficient causation is not concerned with "what the general

[165] Section 1, chapter two of the "Minute Logic."

[166] Aristotle had determined four causes: the material; the formal; the efficient; and the final. Peirce suggests that these four causes are themselves classed into "two grand branches," the efficient (or forceful) and the final (or ideal). See 1.211. My summary of Aristotle's four causes is admittedly minimal; I only refer to it to illustrate Peirce's thoughts as they appear in "A Detailed Classification of the Sciences" (1.203-83).

character of the result may be" (1.212); it is brute force, pure compulsion, without order; "stupid" physical motion, the *hic et nunc* of a thing in existence. The law towards which phenomena may tend provides the final cause; the force compelling phenomena towards the law provides its efficient cause. Law, as final causation, is not a force, but a characterization of the results of that force.[167]

Peirce introduces Aristotle's causation in order to understand the value of classification and to define the relationship between the particular members existing *hic et nunc* that compose a class with the law characterizing that class, the "idea" that begets and defines it. He thus likens final causation with the law characterizing a class, and efficient causation with a class's particular components. When these two features of classification confront one another in the terms of causation, they are found to be both inseparable and non-contradictory. Even though we tend to speak of "ideas," or "notions," or "conceptions," as somehow "abstracted from all efficiency" (1.213), Peirce argues that this is simply a misapprehension of the case, and that for any such abstracted conception, or final cause, an efficient cause may be imagined.[168] "Final causality cannot be imagined without efficient causality," Peirce maintains, "but no whit the less on that

[167] Peirce includes an example that might clarify my summary of his take on Aristotle's causes:

> For example, I shoot at an eagle on the wing; and since my purpose—a special sort of final, or ideal, cause—is to hit the bird, I do not shoot directly at it, but a little ahead of it, making allowance for the change of place by the time the bullet gets to that distance. So far, it is an affair of final causation. (1.212)

So, the completed event, the shooting of the bird, is its final cause. The aiming, steadying, and firing of the rifle was done for the sake of hitting the bird, and thus determines the final cause of shooting an eagle. But, shooting the eagle only names the character of the event, not the total causation of its coming-to-be:

> But after the bullet leaves the rifle, the affair is turned over to the stupid efficient causation, and should the eagle make a swoop in another direction, the bullet does not swerve in the least, efficient causation having no regard whatsoever for results, but simply obeying orders blindly. It is true that the force of the bullet conforms to a law; and the law is something general. But for that very reason the law is not a force. For force is compulsion; and compulsion is *hic et nunc*. It is either that or it is no compulsion. Law, without force to carry it out, would be a court without a sheriff; and all its dicta would be vaporings. Thus, the relation of law, as a cause, to the action of force, as its effect, is final, or ideal, causation, not efficient causation. (1.212)

Law thus names only the ideal or final causation and the relationship of final causation to the action of force. Pure movement is termed efficient causation; its lawful tendencies are termed final causation.

[168] Peirce asks his reader, "did it ever occur to you … that an idea without efficiency is something equally absurd and unthinkable? Imagine such an idea if you can!" (1.213). If an idea was communicated "*viva voca* from another person," for example, Peirce points to the efficiency of particles of air vibrating; if an idea was read in a newspaper, one must consider the "monstrous printing press" it set in motion (1.213). Even the brain could be thought of as a kind of machine compelling the efficient cause of an idea.

account are their modes of action polar contraries" (1.213). Additionally, "an efficient cause, detached from a final cause in the form of a law, would not even possess efficiency" (1.213); for even if its exertions lead to something following *post hoc*, the potential regularity defining it, *propter hoc*, is necessary, less motion imply nothing but chaos. The two "grand branches" of causality are mutually dependent—one cannot be thought without the other—as they offer different modes of viewing the reality of an event while explaining the metaphysics of classification.

That Peirce has in mind this question of the particular and the whole in regards to efficient and final causation is made explicit a few passages later, where he employs dissection to illustrate his argument for the necessity of balancing the dialectic. "Efficient causation," Peirce decides, "is that kind of causation whereby the parts compose the whole; final causation is that kind of causation whereby the whole calls out its parts" (1.220). He builds to this assertion with the follow example:

> Take a corpse: dissect it, more perfectly than it ever was dissected. Take out the whole system of blood vessels entire, as we see them figured in the books. Treat the whole systems of spinal and sympathetic nerves, the alimentary canal with its adjuvants, the muscular system, the osseous system, in the same way. Hang these all in a cabinet so that from a certain point of view each appears superimposed over the others in its proper place. That would be a singularly instructive specimen. But to call it a man would be what nobody would for an instant do or dream. Now the best definition that ever was framed is, at best, but a similar dissection. It will not really work in the world as the object defined will. It will enable us to see how the thing works, in so far as it shows the efficient causation. The final causation, which is what characterizes the *definitum*, it leaves out of account. (1.220)

Dissection is a process itself defined by the motivation to disclose efficient causation; and in this regard, it is "singularly instructive." Though dissection cannot claim to determine the absolute limits and lawful definition of a thing, it will provide the best view of how a thing works. Manners of thinking that resist dissection therefore resist understanding efficient causation, and thus only provide a partial view. "Final causation without efficient causation is helpless," Peirce continues, and "[e]fficient causation without final causation … is worse than helpless" (1.220). The best definition—where "definition" supposes affinity with final causation as an abstraction from the world in which the object defined actually exists—represents a similar dissection; instructive, but incomplete.

And so Peirce's use of dissection here displays how relevant the process was to his thinking as it suggests a call to balance the privileged distinction between the particular and the whole. I read his argument as fostering an approach to philosophical questions that considers both sides—one from the standpoint of the whole that "calls out its parts," and one from the standpoint of "the parts that compose the whole" (1.220); as such, he emphasizes the necessity for any comprehensive classification of knowledge, or science, or philosophy, to approach phenomena from multiple points of view. He would likely argue that Emerson, with his over-emphasis of the whole, of universal, divine laws, and of final causes, ends up promoting a conception of the world that is, ironically enough, necessarily partial and incomplete. As detailed in chapter one, Emerson's resistance to microscopy informs a macroscopical mode of viewing in which the positive/ontological reality of particularity is conceived of as a fallacy, or as a misapprehension of the reality of the whole. But to deny the particular is to deny the efficient cause, which amounts to limiting the role and diversity of modes of causality and perception needed for comprehensive metaphysical questioning. Peirce's project to classify the sciences demanded he reconsider the relationship between the whole and the particular, and, after aligning each with a form of causation, concludes that to understand classification and causality, to understand the very ways of knowing, one must make possible a comprehensive approach that resists privileging one form to another. Emerson appears to foreclose this possibility.

Metaphysics, then, through the favoring of the whole, as primarily concerned with final causes and abstractions from the reality of particularity, begets axioms, general laws, and notions of universality. The question becomes more complex when discerning how this distinction between the particular and the whole is made available to scientific evaluation. The scientist finds herself in a tricky position: on the one hand, she is obliged to assume general laws to guide her observations; on the other hand, she must resist accepting axiomatic principles that she cannot observe—scientific specialists must preserve their "myopic minds." Peirce summarizes the tension in a notebook dated 1905:

> [T]he special sciences are obliged to take for granted a number of most important propositions, because their ways of working afford no means of bringing these propositions to the test. In short, they always rest upon metaphysics … [and must] assume general principles that cannot be proved or disproved by their ordinary work. (1.129)[169]

The scientist must assume general axioms, and axioms can only be determined by the philosopher. So it would seem that Peirce values the whole over the particular, here, saying that investigation of the particular is made possible only through the previous acceptance of some general law. Adopting general principles is something everyone, even the scientist, does, for "[e]very man of us has a metaphysics, and has to have one" (1.129). Peirce goes so far to say, "[f]ind a scientific man who proposes to get along without any metaphysics … and you have found one whose doctrines are thoroughly vitiated by the crude and uncriticized metaphysics with which they are packed" (1.129).[170]

And yet the discrepancies located by the scientist between the general law and the particular phenomena under investigation suggest only that while such phenomena do correspond to a lawful universe, they do not satisfy precisely the laws defined by metaphysics. We might be able to say that the world unfolds lawfully, but we cannot determine exactly what those laws are. If anything, microscopical examination, with its isolation of the particular and its emphasis of the minute, reveals that reasoning about phenomena is always tied to a relative, and therefore non-absolute, mode of observation, that different metaphysical conceptions inform different ways of viewing, and thus different ways of reasoning:

> Now it is one thing to infer from the laws of little things how great things, that consist of little things, will act; but it is quite a different thing to infer from the

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[169] This passage comes from what the editors title, "Introduction showing the point of view from which Philosophy appears to the author to be an interesting subject to a man of common-sense," found in the notebook, "Sketch of Some Proposed Chapters on the Sect of Philosophy Called Pragmatism." See *Collected Papers*, volume I, book I, chapter three.

[170] But this obligation of the scientist to assume general laws, Peirce is quick to point out, ought not result in an uncritical attitude towards the nature of such axioms, regardless of how "self-evident" they may appear to be. Although there is no escape from reliance on metaphysical laws—laws "which evidently never can be rendered probable by observation, and which, if admitted, must, therefore, stand as self-evident" (1.132)—there is equally "no escape from the need of critical examination of 'first principles'" (1.129).

> phenomena presented by great things how single things billions of times smaller will act. (1.129)

Pointing out this distinction—that deducing the probable actions of minute things from general laws is fundamentally different than formulating general laws from out of the observable actions of minute things—proves, for Peirce, that at the very least, one must accept that inconsistencies exist between abstracted laws and actual phenomena.

So the tension that the scientist must navigate, between the particular and the whole, between actual observed phenomena and general principles, is a result of employing novel instruments of observations like the microscope. Usually when an observation is made that challenges a general law, the fault of the inconsistency lies with the instrument, or with the user of the instrument, as providing an error of observation. And Peirce admits that this scenario describes the majority of occasions. However, he is willing to think through the other side, to provisionally accept that the observation was not incorrect, but that, perhaps, the law is not as universal as it pretends:

> Whenever we attempt to verify a physical law, we find discrepancies between observation and theory, which we rightly set down as errors of observation. But now it appears we have no reason to deny that there are similar, though no doubt smaller, discrepancies between the law and the real facts. As Lucretius says, the atoms swerve from the paths to which the laws of mechanics would confine them. I do not now inquire whether there is or not any positive evidence that this is so. What I am at present urging is that this arbitrariness is a conception occurring in logic, encouraged by mathematics, and ought to be regarded as a possible material to be used in the construction of a philosophical theory, should we find that it would suit the facts. We observe that phenomena approach very closely to satisfying general laws; but we have not the smallest reason for supposing that they satisfy them precisely. (1.132)[171]

[171] See Lucretius, "De Rerum Natura" ("On the Nature of Things"), book II, 216ff. Peirce, like Lucretius, adamantly defended free will, spontaneity, indeterminacy, and chance as positively existing forces, what later informed his philosophy of *tychism*. Louis Menand is right to highlight the phrase "a certain swerving" used by Peirce and to view it as one of his chief philosophical obsessions. It is clearly one of the oldest questions in the Western philosophical tradition, which Menand formulates as: "What does it mean to say that a statement is 'true' in a world always susceptible to 'a certain swerving'?" (223). And so it is not difficult to hear the Lucretian echo in Peirce's work when questioning the inconsistencies between scientific observation and the application of general laws. This problem, that the world itself *swerves*, equally informs Peirce's criticism of metaphysics in its overestimation of "truth" and his project to replace the metaphysical registers of "falsity" and "truth" with "doubt" and "belief," a movement that I address in the following section.

When observations challenge the satisfaction of general laws, we must not merely disregard them as errors natural to the process of instrumentalized observation itself, but must investigate why such errors would occur if the general law is to be accepted. Philosophy suffers not only from loose deductive reasoning, but from the "aversion to minute analysis" (2.18) produced by the microscope that discloses the arbitrariness of laws.

The position is repeated in "A Guess at the Riddle," where again Peirce questions the conventional favoring of general laws and the rejection of instrumentalized observation:

> We know that when we try to verify any law of nature by experiment, we always find discrepancies between the observations and the theory. These we rightly refer to errors of observation; but why may there not be similar aberrations due to the imperfect obedience of the facts to law? (1.402)

Those familiar with Peirce's work will no doubt see where this question leads: his "guess" that "law is developed out of pure chance, irregularity, and indeterminacy," that an "element of pure spontaneity or lawless originality mingles … with law everywhere" (1.407), commonly termed his thesis of *tychism*. This thesis comes closest to what might be called Peirce's "first principle," that first principles are themselves composed of irregularity and that *truth* is a metaphysical register incapable of apprehending a world where, as Lucretius writes, "again and again atoms must swerve / a little" ("On the Nature of Things" Bk. II, 243-44). Instead of truth, "[a]pproximation must be the fabric out of which our philosophy has to be built" (1.404).

The significance of Peirce's *tychism*, and the reason why I reference it here, is that it is borne out of a reconsideration of the particular/whole dialectic that itself was generated by Peirce's revival of Asclepiadic dissection and the microscopical isolation of the particular. What might be Peirce's strongest statement for the necessity of philosophy to promote the particular and to analyze the microscopical appears here in "A Guess at the Riddle":

> [W]e must reject every philosophy or general conception of the universe, which could ever lead to the conclusion that any given general fact is an ultimate one. We must look forward to the explanation, not of all things, but of any given thing whatever. (1.405)

Laws do not exist absolutely, and any philosophy that suggests they do must be dismissed. The balance Peirce aimed for between whole and particular, final and efficient causation, is still apparent, in that he does not completely reject nature as obedient to laws—concepts of the whole still have their place. But to realize this balance, scientists and philosophers must recalibrate the question to take seriously what is learned by explaining nature from the view point of the particular. When we apprehend the general from out of the particular, we recognize that laws are not total abstractions, but aggregate tendencies naming approximations for the movements of swerving phenomena. We must not seek to understand things by applying to them an assumed role in a totalizing concept of being, but must attend to the particular to understand how laws come to be formulated. Peirce thus argues for a near perfect inversion of Emerson.

His regular use of instruments of observation prompted this increasing awareness of metaphysical discrepancies, and so the conclusion to be drawn is that his enthusiasm for the microscope is tied to, as it embodies and preserves, Peirce’s call to revive a philosophy that does not refuse dissection, and, by these means, determines the inconsistencies between metaphysical laws and the particular phenomena for which they pretend to account. The microscope, then, must be understood as an instrument that promotes a certain mode of engaging the physical world, a way of viewing the world from out of the particular, that challenges metaphysics, universality, final causes, and first principles. If philosophy continues to define the particular only from the standpoint of the whole, it will only continue to obscure reality by ignoring the nature of general laws as mere approximations. The microscope takes on further emphasis in Peirce’s work precisely as an instrument employed to illustrate his project to replace metaphysics with science, to which I now turn.

Microscopical Science vs. Macroscopical Metaphysics

Microscopical knowledge clearly informs Peirce's positions on observation, classification, the mind/world affinity, the operations of cognition, and logic as a version of microscopical analysis. It operates in his uncovering of philosophy's traditional suppression of dissection as a mode of reasoning at variance with conceptions of the whole; the microscope exposes the unsatisfactory nature of general laws by displaying their inconsistencies with the singular occurrences for which they stand. "Isolating the particular" forces metaphysics, as a mode of thinking dependent on presbyopic vision and universal laws, to admit its overlooked aberrations and distressingly untenable conceptions of truth. In Peirce, the microscope comes to represent science in its confrontation against metaphysics, and illustrates his call to rethink traditional notions of truth.

Indeed, the very idea of "fixing belief" results from a revision of classical and idealist notions of truth as a metaphysical entity.[172] Peirce argues that correct judgments

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[172] In brief, Peirce determines four methods of establishing an opinion, or "fixing a belief." Each method has been routinely practiced throughout history as the intellect evolved, and each has formed unique manners of reasoning with distinct ideological consequences. These methods are: 1.the method of tenacity; 2. the method of authority; 3. the *a priori* method; and 4. the scientific method. Because settling opinion is nothing other than quieting doubt, Peirce characterizes each method as an historically established means of satisfying the uneasy feelings provoked by skepticism. Those who practice the *method of tenacity* when faced with challenges to their belief systems will, like ostriches, bury their heads in the sand, hiding the danger, "and then calmly say there is no danger" (5.377). Such adherents to tenacity go through life "systematically keeping out of view all that might cause a change in [their] opinions" (5.377). Peirce argues that this method does not hold up well to the regular confrontations it faces through societal living—"the social impulse is against it" (5.378). Thus, this method endorses a willful self-ignorance. The *method of authority* maintains an "immeasurable mental and moral superiority to the method of tenacity" (5.380) chiefly because of its social indoctrination. It has been immensely more successful. The method of authority permits the state to remove doubt from "men's apprehensions," keeping them ignorant. "When complete agreement could not otherwise be reached," Peirce describes, "a general massacre of all who have not thought in a certain way has proved a very effective means of settling opinion in a country," thus characterizing the method of authority as, "from the earliest times … one of the chief means of upholding correct theological and political doctrines, and of preserving [the state's] universal or catholic character" (5.379). Besides the clear ethical flaws with this method, where it often results in totalitarianism and war, the state simply cannot perfectly regulate opinions on every subject, and so doubt will inevitably emerge. The third method, the *a priori method*, is one that emphasizes the affinity between the world and the individual's mind, and that develops beliefs by adopting opinions which seem the most "agreeable to reason" (5.382). This method, "[t]he most perfect example of [which] is to be found in the history of metaphysical philosophy" (5.382), is far more acceptable than the methods of tenacity and authority because it respects the power of reason and expresses the "instinct which must be the ultimate cause of belief in all cases" (5.383), that is, it most closely coincides with the nature of thinking itself, as the

are not to be qualified by their relative distance from an abstracted conception of truth, but rather by their success in satisfying the uneasy state provoked by feelings of doubt. Both "The Fixation of Belief" and "How to Make our Ideas Clear" are motivated by this attempt to replace the registers of "falsity" and "truth" with the process of "doubt" to "belief." Truth comes to signify the settlement of opinion, the extinguishing of doubt as a mental irritation.[173] The movement from doubt to belief designates "the starting of any question … and the resolution of it" (5.394), as it parallels Peirce's evolutionary cosmology and the nature of logic, the movement from the indefinite to the definite, from the vague to the clear. Fixation of belief marks Peirce's contribution to the modern break with idealist metaphysics in its reevaluation of truth as necessary and realistic. The further connection I make is that the revision to truth that led to the methods of fixing

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recognition of doubt and the instinctual settling of it. However, this method does not agree so much with experience and facts as it does with "that which we find ourselves inclined to believe" (5.382). It is remarkably subjective in that different people find phenomena "agreeable to reason" is widely differing ways, and thus is prone to certain unreasonable generalities, where the individual metaphysician makes the world of his individual way of thinking. Ultimately, the method fails by making inquiry "something similar to the development of taste; but taste, unfortunately, is always more or less a matter of fashion, and metaphysicians have never come to any fixed agreement" (5.383). The most reasonable method of fixing belief is *the scientific method*, the method that is most self-regulative, meta-critical, consensual, courageous, and realistic.

[173] This is to say that Platonic conceptions of truth, as ideal and immutable, elevated and sanctified, as somehow existing outside of existence, are and always have been intimately wrapped up with metaphysical thinking. Peirce works to undo this conception, going so far as to argue that even Plato's theory of forms is a product of evolution, that the forms themselves, if we are to accept them, must evolve—see "The Logic of Continuity," where Peirce writes, "[t]he evolutionary process is, therefore, not a mere evolution of the *existing universe*, but rather a process by which the very Platonic forms themselves have become or are becoming developed" (6.194). Peirce thus offers a different version of truth, one in which its metaphysical features are extracted: "truth" is not permanent, but marks a process of doubt to belief. There are no facts, exactly, but reasoned and rational approximations of habits, or tendencies. Aggregated approximations, when observed long enough, may be called "laws." This is to say that "truth" is nothing but a temporarily verifiable belief, and belief itself is nothing but habit. Doubt is instinctual, like hunger, and emerges to direct the desire and to destroy it with belief. Belief, then, is the fixing or settling of an opinion in response to doubt, in an attempt to rid it. The function of truth thus marks a further correspondence between the rational mind and the laws of the universe, where the features of the world and the swerving of its atoms become increasingly regular, unfolding from chaos to order, from desire/doubt to satisfaction/belief—see "How to Make Our Ideas Clear," 5.397. Nietzsche makes a similar move in "On Truth and Lying in a Non-moral" (1873), as is suggested by the title: "truth" is usually contrasted with "falsity," not "lying." Humans lie and humans believe; Nietzsche's argument similarly shifts the registers of judgments from questions of "truth" to questions of "belief." Though Peirce might agree with Nietzsche—in the sense that there are "no facts," only interpretations and approximations—that does not mean that there is "only fiction." There may not be universal, immutable occurrences or ideas, but there is regularity, continuity, and correspondence. Truth might best be thought of as Peirce thinks of the definition of classes, that is, as a "story without an end" (1.228).

belief was itself generated by Peirce's recognition that particular phenomena display aberrations of general laws, a recognition made possible by the microscope.[174]

Peirce does not always stand in absolute opposition to metaphysics; he regularly argues that metaphysics has its place in any comprehensive philosophical system, as a specialized method with refined, though limited, modes of observation and reasoning. He associates metaphysics with the third method of fixing belief, the *a priori* method, and argues that this method "is far more intellectual and respectable from the point of view of reason" than both the methods of authority and of tenacity, viewing it as a valuable step in the evolution of the intellect. Descartes is to be applauded for "passing, in the directest way, from the method of authority to that of apriority" (5.391) by internalizing skepticism and by emphasizing doubt as the most suitable manner to "set about the reconstruction of philosophy," and thus to "discard the practice of the schoolmen of looking to authority as the ultimate source of truth" (5.391).[175]

Metaphysics has its place not only as a method of fixing belief, but, classed under philosophy—and often standing in for Philosophy as such—it is responsible for a particular manner of observation "whose business it is to find out all that can be found out from those universal experiences which confront every man in every waking hour of his life" (1.246). This position concerning metaphysics is routinely reflected in Peirce's consideration of how each division of the sciences might employ microscopes. For example, after characterizing philosophy as a science that "contents itself with observations such as come within the range of every man's normal experience," Peirce adds, "[e]vidently, therefore, no microscope … would be of the least use" (1.241).

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[174] We remember that Peirce's process of separating the elements of consciousness into doubt and belief was the result of describing phenomena "as they appear under a mental microscope" (5.394).

[175] In "The Age of the World Picture," Martin Heidegger argues "[w]e first arrive at science as research when and only when truth has been transformed into the certainty of representation. What it is to be is for the first time defined as the objectiveness of representing, and truth is first defined as the certainty of representing, in the metaphysics of Descartes" (127). That Descartes marks a fundamental shift in Western philosophy does not need elaboration, but specifically in regards to the current discussion, I mean to point out that Descartes, as characterized by Peirce and Heidegger, alters the question of truth to the question of *certainty*. Metaphysical systems of truth, understood as a general law, has historically endorsed programs of authority, while the movement to belief highlights the features of self-interest complicit in privileging one system to another. Descartes modernized philosophy not merely by revising philosophical inquiry from questions concerning truth to questions concerning certainty, but by the consequences of the revision, that resulted in a dismissal of authority and the production of a scientific method of fixing belief.

Similarly, when arguing for the elevated importance given to "the eternal life of the ideas Truth and Right," in the "Minute Logic," ideas Peirce here grants some measure of *a priority*, ideas that are clearly the business of metaphysics, he includes the qualification: "That it is so is a matter of experiential fact. But whether it is so or not is not a question to be settled by producing a microscope or telescope or any recondite observations of any kind" (1.219). In these examples, Peirce's position appears to be that the metaphysician should not be faulted for his variance with the scientist; his work is simply the product of his manner of observation, a field of view that must be contained by a comprehensive classification of the sciences. Like the scientist, the metaphysician

> is engaged in the investigation of matters of fact, and the only way to matters of fact is the way of experience. The only essential difference between metaphysics and meteorology, linguistics, or chemistry, is that it does not avail itself of microscopes, telescopes, voyages, or other means of acquiring recondite experiences, but contents itself with ascertaining all that can be ascertained from such experience as every man undergoes every day and hour of his life. All other differences between philosophy and the special sciences are mere consequences of this one. (8.110)

Peirce thus defines metaphysics by its aversion to instruments like the microscope, suggesting that when he employs the microscope, he does so as a stand-in for the special sciences that are inversely defined by an aversion to metaphysics. But this does not necessarily mean that metaphysics, by refusing modes of observation outside of everyday experience, is therefore useless. In fact, when putting together the "Detailed Classification of the Sciences,"[176] Peirce maintains the opposite opinion, arguing that "philosophy … must necessarily have its application in every other science":

> For be this science of philosophy that is founded on those universal phenomena as small as you please, as long as it amounts to anything at all, it is evident that every special science ought to take that little into account before it begins work with its microscope, or telescope, or whatever special means of ascertaining truth it may be provided with. (1.246)[177]

[176] The chapter title "A Detailed Classification of the Sciences" refers to section 1, chapter two of the "Minute Logic." See the *Collected Papers*, volume I, book II, chapter two.

[177] Though philosophy influences all sciences in some way, some sciences, like idioscopy, "only resorts to philosophy in order that certain obstacles to its pursuing its proper special observational inquiries may be cleared out of the way" (1.278). Other sciences, those that share or are "based upon the same sort of general experience upon which philosophy builds" (1.278) "only resort to special observation to settle some minute

In regards to philosophy as a scientific class, the microscope appears superfluous. Furthermore, Peirce suggests that before one uses a microscope, one ought to become familiar with philosophy, implying that proper microscopical investigation is one guided by knowledge of general, metaphysical laws. And so metaphysics, as that science associated with the *a priori* method of fixing belief, defined by its explicitly non-microscopical mode of observation, has its place; though the *a priori* method is becoming outdated, it does not merely fall by the wayside.

And yet, despite the esteem Peirce awards metaphysics in the passages above, a contrary position nonetheless emerges; reading his works, one sees increased levels of dissatisfaction as he adamantly faults metaphysics for stifling intellectual advancement. In the introduction to "A Guess at the Riddle," for example, he offers the backhanded compliment that "weak metaphysical trash has sometimes contained the germs of conceptions capable of growing up into important and positive doctrines" (1.364). When detailing the necessity of minute analysis, the chief feature of critical logic emphasized by microscopical scrutiny, Peirce writes, "you may search the whole library of modern metaphysics from Descartes to the most accurate metaphysical reasoners of today and hardly find a vital argument … that does not leave room to drive a coach and four through it" (2.9). In "The Logic of Events," he argues, "there is one highly abstract science which is in a deplorably backward condition … I mean Metaphysics," whose "defective and bad" condition has been "injurious to the physical sciences" (6.2).[178]

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details, concerning which the testimony of general experience is possibly insufficient" (1.278). Observation is still the primary feature of differing sciences, that allows for and demands their classification, and the discovery of minute details—disclosed by instruments like the microscope—more often than can be overlooked, indicate contradictions to "the testimony of general experience" (1.278) or the primary mode of engagement with which philosophy contents itself, and thus proves philosophy insufficient.

[178] Peirce adds the following to his claim concerning the "immature condition of Metaphysics":

> The common opinion has been that Metaphysics is backward because it is intrinsically beyond the reach of human cognition. But that, I think I can clearly discern, is a complete mistake. Why should metaphysics be so difficult? Because it is abstract? But the abstracter a science is, the easier it is, both as a general rule of experience and as a corollary from logical principles. Mathematics, which is far more abstract than metaphysics, is certainly far more developed than any special science; and the same is true, though less tremendously so, of logic. But it will be said that metaphysics is inscrutable because its objects are not open to observation … The things that any science discovers are beyond the reach of direct observation. We cannot see energy, nor the attraction of gravitation, nor the flying molecules of gases, nor the luminiferous ether, nor the forests of the carbonaceous era, nor the explosions in nerve-cells. It is only the premisses of

"Historically," Peirce continues a few passages later, "we are astonished to find that [metaphysics] has been a mere arena of ceaseless and trivial disputation," and, worse still, that "it has been pursued in a spirit the very contrary of that of wishing to learn the truth" (6.5). As such, it merely "kneads over and over what we know already" (5.614); it is outmoded and "unverifiable." To "accept it as sufficient would be to block the road of inquiry" (6.273).[179]

The problems with metaphysics are equally informed by its seminarian upbringing; to argue that truth—as unchangeable, self-evident, and *a priori*—exists is to argue for infallibility, and science must dismiss all notions of infallibility. As it is driven by errors, science must take up propositions only provisionally in order to refute them, not to confirm them.[180] The scientist "who has any such immovable beliefs to which he regards himself as religiously bound … cannot at the same time desire to have his beliefs altered" (6.3). "In my opinion," Peirce decides in "The Logic of Events," "the chief cause of [the] backward condition [of metaphysics] is that its leading professors have been

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> science, not its conclusions, which are directly observed. But metaphysics, even bad metaphysics, really rests on observations, whether consciously or not; and the only reason that this is not universally recognized is that it rests upon kinds of phenomena with which every man's experience is so saturated that he usually pays no particular attention to them. The data of metaphysics are not less open to observation, but immeasurably more so, than the data, say, of the very highly developed science of astronomy, to make any important addition to whose observations required an expenditure of many tens of thousands of dollars. No, I think we must abandon the idea that metaphysics is backward owing to any intrinsic difficulty of it. (6.2)

Whereas before Peirce applauded metaphysics for its role as the science of common observation, he now shifts his position, arguing that, as the science of common observation, it must make proper use of its data and resist the urge to qualify itself as "inscrutable." That is, metaphysics must become more like the natural sciences.

[179] Additionally, in his entry for "Scientific Method" included in volume II of James Mark Baldwin's *Dictionary of Philosophy and Psychology* (1902), Peirce points out to the student of the scientific method that he must "reform his metaphysics," and, if the student "thinks he has no metaphysics," that "[t]hat will be a sure sign that he is badly handicapped with metaphysics of the crudest quality" (7.82). Furthermore, in his review of Josiah Royce's *The World and the Individual*, Peirce pokes fun at metaphysicians for their elevated sense of self-importance and their resistance to consensus: "Does the reader dabble in metaphysics? If he does, we make no sort of doubt that his opinions on such matters are nearer correct than those of any other human being; for we have talked with a hundred metaphysicians without ever yet meeting one who was not vastly superior to all the rest. So, *a fortiori*, the same superiority must be enjoyed by the gracious reader" (8.108).

[180] The problems Peirce finds with metaphysics include: unrealistic conceptions of immutable, abstracted truth; adherence to universal laws resulting in the reluctance to accept the particular; and emphasis on a kind of introspection that consequently rejects consensus, variant methods of reasoning, and minute logic/analysis. See also 6.216 where Peirce makes explicit his distinction between science and religious belief.

theologians" (6.3), "philosophers bred in theological seminaries, whose ruling impulse is to teach what they hold to be infallibly true" (1.4). As such, metaphysics, though it often behaves scientifically by offering observations and hypotheses, has a long history of promoting the explicitly unscientific attitude of seeking confirmation of pre-established beliefs instead of seeking errors and falsifying conclusions; this way of thinking amounts to the assertion that existent external "powers" act through things, as an element "which is to be taken into account of beforehand" (8.12). This is deductive thinking at its worst, as it manufactures particular occurrences to fit within a categorical and hierarchical ontology that privileges *noumena* to *phenomena*.[181] The action of "powers" that move things is nothing but a "fiction of metaphysics;" a conclusion that "obvious[ly] … harmonizes with a belief in an infallible Church" (8.12).

While critical of metaphysics in "How to Make Our Ideas Clear" (1878), his position strengthens in "The Logic of Events" (1898), and becomes decisive in the essay series defining pragmatism for *The Monist* between 1905 and 1906.[182] He once hoped to rescue metaphysics from its condition as a "puny, rickety, and scrofulous science," hoping that "the disputes and obscurities of the subject may at last disappear" (6.5-6); but by the time he writes "What Pragmatism Is," this hope appears lost. His answer to the question, "What, then, is the *raison d'être* of the doctrine [of pragmatism]?" is clear:

> [Pragmatism] will serve to show that almost every proposition of ontological metaphysics is either meaningless gibberish … or else is downright absurd; so that all such rubbish being swept away, what will remain of philosophy will be a series of problems capable of investigation by the observational methods of the true sciences. (5.423)

There is no doubt to what extent Peirce thought pragmatism capable; it would offer a modern philosophical system that "extracts" from philosophy a "precious essence" that has been distorted and all but destroyed by the "interminable misunderstandings and

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[181] The construction of metaphysical categorical hierarchies sustains an unethical social politic, which will be further explained below in my reading of Herman Melville's "Benito Cereno."

[182] In "How to Make Our Ideas Clear," Peirce characterized metaphysics as "a rich mud of conceptions" that needs logic to clean up the obscurity, which suggests a critical, but not quite dismissive, attitude. The essays that appeared in the *The Monist* between 1905-6 include: "What Pragmatism Is" (*The Monist* vol. 15, 161-81, 1905; 5.411-37); "Issues of Pragmatism" (*The Monist* vol. 15, 481-99, 1905; 5.438-63); and "Prolegomena to an Apology for Pragmatism" (*The Monist* vol. 16, 492-546, 1906; 4.530-72).

disputes" of seminarian metaphysicians (5.423). What remains would be a series of problems capable of investigation by the observational methods of the special sciences. Peirce was certain that philosophy could "give life and light to cosmology and physics," could come to the advanced condition alongside science, as long as pragmatism was taken up to rid philosophy of any metaphysical tendencies. He is convinced that the doctrine "would wipe out metaphysics" (5.423) once and for all, and looks forward to its erasure with enthusiasm. The microscope, and the ideas of minute analysis, dissection, and inductive logic that the instrument preserves, will inform Peirce's anti-metaphysical stance, particularly as a tool of verification, a window to the microcosmos of animalcules, and a means of challenging Platonic Forms.

Peirce qualifies the microscope as a tool of verification in the service of maintaining his criticism of metaphysics. To extract from philosophy a series of problems that could be observed is to extract problems the answers to which could be verified. Provisional verification thus conditions proper philosophical reasoning; when metaphysics is "wiped out," the term "metaphysical" comes to mean merely "unverifiable." As referenced above, Peirce defines the microscope as an instrument of verification that lends a "logical advantage" to the materialist; while other theorists must attribute their reasoning to some "metaphysical agency out of the realm of verification," the materialist, when pressed, "fetches out his microscopes … and endeavors to verify his theory" (6.275). Peirce uses this example of the "materialist who employs microscopes" to illustrate the benefits of a "modern theory" in which metaphysics have been eliminated. He explicitly follows the lead set by Auguste Comte, who argued just as harshly against "the aberrations of the metaphysicians" (421-2) in the first volume of his *System of Positive Polity*, and who, according to Peirce, "applied the epithet *metaphysical*" to theories deemed "unverifiable" (6.273). The microscope thus represents "science" as a method that challenges metaphysics by promoting external verification; science, by "availing itself of microscopes," is not merely distinguishable from metaphysics, but superior.

He will further his affinity with Comte concerning the inadequacy of metaphysics by describing what Comte had in mind when calling his philosophy *Positive*. "He plainly meant," Peirce claims, "that [philosophy] should be unlike the metaphysical thought which kneads over and over what we know already, and would be like the sort of material which is furnished by a microscope" (5.614).[183] The microscope is more than a mere instrument of observation; it is a means to rescue philosophy, by ridding it of the ceaseless disputations resulting from the lack of verification ignored by metaphysics, and by bringing it "to a condition like that of the natural sciences" (5.413).

The medical discourse generated by microscopy—concerning antiseptics, viruses, and bacilli—further informs Peirce's anti-metaphysics. In his 1867 report "On the Antiseptic Principle in the Practice of Surgery," Joseph Lister details his use of carbolic and phenic acid during surgery to eliminate the "minute organisms suspended in [the atmosphere]" (86) that cause destructive suppuration.[184] Lister's father, Joseph Jackson Lister, was an amateur microscopist who engineered a number of advancements to the achromatic lens objective through combining doublets and aplanatic focal points.[185] Clearly influenced by his father's work in microscopy, as well as Louis Pasteur's observations of germs and putrefaction, Lister developed surgical methods that could best ensure minimal infection in the operating room by eliminating injurious bacteria and microorganisms.[186]

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[183] Peirce makes this claim in response to James B. Peterson's essay "Some Philosophical Terms," published in *The Monist* (1905). See note 67 above.

[184] Lister defines the motivation of his experiments, the purpose of his article, and his appreciation of Pasteur's work, at the beginning of "On the Antiseptic Principle in the Practice of Surgery," writing,

> To prevent the occurrence of suppuration, with all its attendant risks, was an object manifestly desirable; but till lately apparently unattainable, since it seemed hopeless to attempt to exclude the oxygen, which was universally regarded as the agent by which putrefaction was effected. But when it had been shown by the researches of Pasteur that the septic property of the atmosphere depended, not on the oxygen or any gaseous constituent, but on minute organisms suspended in it, which owed their energy to their vitality, it occurred to me that decomposition in the injured part might be avoided without excluding the air, by applying as a dressing some material capable of destroying the life of the floating particles. Upon this principle I have based a practice of which I will now attempt to give a short account. (86)

Thomas Brock points out that, while Lister's work undoubtedly had a "tremendous influence on the practice of surgery," introducing numerous surgical procedures that had been previously impossible, the use of carbolic acid as an antiseptic has been proven to be unprofitable, since it is "fairly toxic to the host" (89).

[185] See Feffer 25.

[186] The origin of microbiology is usually attributed to Leeuwenhoek's discovery of the "little animals" known as animalcules; the development of antiseptics further established the advantageous potential of microscopical investigation.

Peirce, we know, was familiar with Pasteur's work.[187] He must have been as familiar with the medical applications of Pasteur's discoveries as he employs the language of antiseptics in his criticism of Concord transcendentalism. In the opening passages of "The Law of the Mind,' he offers his readers a "mental biography," a brief narrative describing his philosophical upbringing:

> I was born and reared in the neighborhood of Concord—I mean in Cambridge—at the time when Emerson, Hedge, and their friends were disseminating the ideas that they had caught from Schelling, and Schelling from Plotinus, from Boehm, or from God knows what minds stricken with the monstrous mysticism of the East. But the atmosphere of Cambridge held many an antiseptic against Concord transcendentalism; and I am not conscious of having contracted any of that virus. Nevertheless, it is probable that some cultured bacilli, some benignant form of the disease was implanted in my soul, unawares, and that now, after long incubation, it comes to the surface, modified by mathematical conceptions and by training in physical investigations. (6.102)[188]

Emerson appears "sick," here, having "caught" the "virus" of "monstrous mysticism," a description that surely displays a thinly veiled racism leveled at non-Western, non-scientific thinking.[189] "Bacilli," a class of microscopical vegetable organisms associated with tuberculosis, typhoid fever, and diphtheria, is here characterized as generated by Concord philosophy, resulting in a disease implanted in Peirce's young soul. Cambridge is defined against Concord transcendentalism for its "antiseptic" qualities, suggesting that the advancements made in the natural sciences at Harvard might purify transcendentalist metaphysics of its airborne pathogens, the "germs" poisoning and putrefying philosophy. Peirce wishes to distinguish his work from that of the transcendentalists, and he does so by describing them as infectious: metaphysics is a disease discovered at the level of viruses and bacilli, disclosed by microscopical scrutiny. The microscope thus lends Peirce a vocabulary to define his position against Emerson and his outmoded seminarian philosophy.

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[187] See above, where I explain Peirce's reference to Pasteur's microscopical examination of ferments in his illustration of how science evolves by the introduction of novel instruments of observation.

[188] "The Law of the Mind" is the third paper of a series published in volume II of *The Monist* in 1892.

[189] The nascent racism in this passage will be taken up at the chapter's conclusion, as well as in my study of Melville below.

The challenge to metaphysics promoted by the microscope, as an instrument of dissection, minute logic, and inductive reasoning, amounts to a return to Aristotle, which is equally, for Peirce, an erasure of Platonic Forms and the end of philosophy. "The truth is," Peirce writes,

> that the minds from whom the spirit of the age emanates have now no interest in the only problems that metaphysics ever pretended to solve. The abstract acknowledgment of God, Freedom, and Immortality, apart from those other religious beliefs (which cannot possibly rest on metaphysical grounds) which alone may animate this, is now seen to have no practical consequence whatever. The world is getting to think of these creatures of metaphysics, as Aristotle of the Platonic ideas: *τερετίσματα γάρ ἐστι, καὶ εἰ ἔστιν, οὐδὲν πρὸς τὸν λόγον ἐστίν* ["As for the Forms, we are leaving them aside; for they are meaningless sounds, and they contribute nothing to this discussion even if they exist"]. The question of the grounds of the validity of induction has … excited an interest, and may continue to do so … This is the prevalent feeling, among advanced minds. (8.8)[190]

Peirce once again calls upon Aristotle to revive the notion that philosophy can be separated from idealist metaphysics and its consequent method of deduction.[191] The microscope, by fostering a mode of vision that encourages inductive reasoning—reasoning from out of the isolated particular—thus defines the "spirit of the age," the age of evolutionary science, specialization, and the myopic mind, the age distrustful of "creatures of metaphysics." What these "advanced minds" are chiefly interested in, Peirce argues, is the "question of the grounds of the validity of induction" (8.8); and the interest is motivated by the same insight as that voiced by Asclepiad Aristotle above: the hope that to develop a successful method of inductive reasoning could reverse metaphysics, could undo its grip on speculative thinking, and could erase the bars it sets against scientific advancement. Peirce had paraphrased Aristotle before, saying "[w]e

[190] This passage can be found in Peirce's review of Alexander Campbell Fraser's *The Works of George Berkeley, D.D., formerly Bishop of Cloyne: including many of his Writings hitherto unpublished*. The quotation from Aristotle is left untranslated in the original. The translation I include comes from Hippocrates G. Apostle's *Aristotle's Posterior Analytics*. E.S. Forster offers a similar translation: "The Forms may be dismissed—they are mere prattle; and even if they exist, they are irrelevant" (121).

[191] This passage appears in the opening paragraphs of Peirce's review, where he introduces Berkeley's metaphysics as denying "the existence of matter, our ability to see distance, and the possibility of forming the simplest general conception," while admitting "the existence of Platonic ideas," and arguing for "the whole with a cleverness which every reader admits, but which few are convinced by" (8.8). Peirce further defines his age, here, by saying "it is true that we of this day are skeptical and not given to metaphysics." Peirce then quickly moves to a discussion of inductive logic as a chief concern "among advanced minds" (8.8).

must philosophize … if only to avoid philosophizing" (1.129). The creation of a way of thinking that employs microscopical methods—dissection, isolation, induction—this is the philosophizing Peirce undertakes, if only to avoid further need of philosophy.

For both Peirce and Emerson, the microscope represents an epistemological formulation, a manner of understanding the world, a microscopical mode of understanding. Whereas Emerson's resistance to microscopy reveals his confidence in a totalizing manner of vision and his devotion to a conception of the whole, Peirce's training in microscopy brings him to rethink the roles of observation, the classifications of thought, the affinity between mind and world, and the history of metaphysics. The microscope made available a novel means of viewing the corporeal world, which consequently led to novel manners of criticizing metaphysics, exposing the "Hellenic repugnance to dissection," the traditional aversion to the minute, and the privileging of the whole, and of immutable truth. "Modern science," Peirce contends, "with its microscopes … has put us into quite another world; almost as much so as if it had transported our race to another planet" (5.513). His work, defined by the ideas of microscopy, thus sets forth a philosophy for the new era of modern science, an era where the previously invisible microcosmos has been revealed, and where "[s]ome of the old beliefs," belief in the Forms, of conceptions of the whole, and of universal laws, "have no application" (5.513). The microscope not only embodies those characteristics by which scholars define late modern and contemporary philosophy, but, in many ways, made the questions taken up in twentieth century philosophy available, disclosing new phenomena for inquiry and demanding new manners of reasoning to account for them. Peirce's philosophy and the positions he assumed during this polemical period—where traditional manners of thinking about science, philosophy, and observation shift from the transcendental to the pragmatic, and from the metaphysical to the physical—cannot therefore be properly understood without recognizing the significance of the microscope.

Peirce's Metonymy after the Microscope

Emerson had turned to the microscope to define Plato's Europe before his homecoming from the East, as a "result-loving … surface seeking" culture uninformed by the delightful abstractions and conceptions of unity cultivated in Asia ("Plato; or, The Philosopher," *W* 4:52-4). The Greek emphasis of details, particulars, and the minute, according to Emerson, provided an extreme mode of vision that Plato balanced by introducing "the idea of one Deity, in which all things are absorbed" (*W* 4:53). The combination of East and West, or the folding of the particular into the whole, provided for Plato a novel position from which to look upon objects, and from which to name them, "sometimes after their appearance, sometimes after their essence ("The Poet," *W* 3:21). Greek vision before Plato was flawed in Emerson's estimation and would promote a flawed theory of language in its inability to properly comprehend the whole. The symbol, then, as analogous to macroscopical vision, becomes the privileged trope that best represents the structure of nature and the connection between mind and Over-Soul, displaying reality as a correspondence between material objects and spiritual facts; the symbol reduces the particularity of things by defining them through the single law and common referent called the Over-Soul, and consequently reproduces a stabilized pattern of meaning guided by Spirit. That is, a comprehensive, absolute, and homogenous universe is a universe best understood as symbolic.

Emerson's symbolism is without doubt informed by his confrontation with, and ultimate hostility towards, the microscopical; he maintains a theory of language intimately linked to his transcendentalist metaphysics that leads to a set of questions regarding the status of the particular and the means of articulating general laws. Just as the resistance to microscopy speaks to Emerson's privileging of the symbol, Peirce's adoption of microscopy speaks to his semiology. His uncovering and endorsing of the ideas preserved by the microscope—namely, particularity, dissection, and induction—results in both a fixed anti-metaphysics and an approach to language representative of his microscopical vision and myopic mind. A dissected universe is a universe best understood as metonymic.

The spirit of dissection is perhaps most strongly felt in Peirce's approach to language. It pervades his logical methods and his analysis of propositions, assertions, predicates, and the sign. For instance, when defining the role of "negation" in logical inquiry, Peirce argues that, in order to trace the "relations between propositions, it is necessary to dissect the propositions to a certain extent" (2.379).[192] He then states that there are a few "different ways in which propositions can be dissected," but that the most common method, the one most sufficiently studied and usefully employed by logicians, proceeds by "[t]aking any proposition whatever" and focusing on "certain parts [that] may be struck out to leave a blank form" (2.379). Suspending the strict rules of grammar and filling in these blanks produced by dissection of the proposition allows the logician to qualify the proper employment of negation and thus the closest possible approximation between any particular proposition and the conditions that determine its truth.

The many graphs and diagrams lacing his works on symbolic logic were, as noted above, employed in order to "dissect the operations of inference into as many distinct steps as possible" (4.424). An example, to take just one, appears in his definition of "Relatives" in Baldwin's *Dictionary*:

> Relatives: If from any proposition having more than one subject (used to include "objects") we strike out the indices of the subjects, as in "——— praises ——— to ———," "——— dat in matrimonium ———," what remains and requires at least two insertions of subject-nouns to make a proposition is a "relative term," or "*relative rhema*," called briefly a "relative." The relative may be converted into a complete assertion by filling up the blanks with proper names or abstract nouns; this serves as a criterion. (3.636)

Peirce displays how the logician dissects a proposition by striking out its operative subjects in order to isolate its relative terms. The procedure not only displays the relations sustained by any proposition when relative terms are substituted—that is, when a relative term is replaced by its negation—but also consequently determines the form of the aggregate assertion. He thus illustrates a manner of defining the form of the proposition inductively, as an aggregate of the particular terms composing the assertion, rather than

[192] Peirce's entry for "negation" was co-authored by Christine Ladd-Franklin, and can be found in Baldwin's *Dictionary of Philosophy and Psychology*.

deductively, which would define the relative terms by their place in the whole proposition.

Dissection defines pragmatic logic. Peirce's view of the predicate, for example, which he likewise describes in Baldwin's *Dictionary*, comes about by the same surgical procedure, by taking "any proposition, i.e., any statement which must be true or false" and "let[ting] some parts be struck out" (2.358). Indeed, dissection of the proposition into subject and predicate is what allows Peirce to separate the "scholastic phrases" categorizing the many variations of analogical, denominative, dialectic, direct, essential, exercised, formal, and natural predications. That is, recognizing the many ways in which predication may be understood is in direct accord with "the conception entertained of the dissection of a proposition" (2.360), as it characterizes "the view which pragmatic logic takes of the predicate" (2.358).[193] Peirce likely had the "Hellenic repugnance to dissection" in mind as the process comes to define a contrary approach to philosophical questions; no matter what the topic, traces of this "logical method"—borne out of Asclepiadic training in the dissection-room—may be discerned. Dissection determines his method of pragmatic logic and represents the manner of cognition enacted by the microscopical mind.

Investigating how the microscope informs Peirce's thoughts on language moves beyond his pragmatic methodology, his dissection of propositions. Catherine Wilson brings to light an important point regarding what, exactly, the microscope produces, a point that will prepare this study to make a statement concerning Peirce's semiotic. When contemplating the purpose of microscopical research, what results the microscope generates, what knowledge of the world can be obtained through observation of the minute, early microscopists tended to shrug their shoulders. "What faced the microscopist," Wilson contends, "was the absolute unintelligibility of the structures

[193] Peirce will further emphasize the surgical quality of pragmatism in Part I of "Lectures on Pragmatism" delivered at Cambridge in March of 1903. When providing the pragmatist answer to the "question of the nature of belief," he argues that, for the pragmatist, "*judgment* is held to be … an *assertion to oneself*," and thus to address the nature of judgment, one must "analyze the nature of *assertion*" (5.29-30). To demonstrate this position, he takes the case of an affidavit, which he characterizes as an "easily dissected example … where the assertive element is magnified" (5.30). Thus a defining feature of pragmatist philosophy, the position it holds concerning the nature of judgment, is one qualified by dissection and magnification.

perceived" (230). Though originally fostered by the enthusiasm that to discover the minute parts of an organism would lead to a comprehensive understanding of how that organism naturally functioned in the perceptual world, microscopy, it was discovered, could only provide ambiguous answers. The microscope simply produced more appearances to be observed, described, and categorized, making the microscopist a kind of specialized phenomenologist whose business, according to Peirce, "is simply to draw up an inventory of appearances without going into any investigation of their truth" (2.120). Wilson further argues, "Greater magnification, a sharper image, more convenient microscopes, do not seem to be the answer: more images amount to more mystification. The microscopist who examines a plate with lenses of successively higher power sees new structures emerge and the earlier ones disappear from view" (231). To discover the truth is to locate how these appearances are connected, to "penetrate into the reason of things" (1.44). But the microscope does not appear to offer this kind of knowledge. "[W]hy should we admit," Wilson asks,

> that the image delivered by the microscope is a better image, or a deeper or truer image, rather than simply another image? … We see only surfaces … therefore whatever we see is scenery and not truth … Microscopy generates representations, but representations by themselves do not explain anything. (255)

The microscope certainly provoked a sense of dislocation between the visible world and the microworld by bringing new phenomena into being.[194] It exposed a remarkable ambiguity between the microscopical and macroscopical, that, though at certain points displayed harmony, at others displayed a strong line of demarcation ultimately leading to Peirce's argument against the hasty formation of universal laws. But truth itself it could not locate. As Wilson paraphrases George Berkeley, "[t]o describe the appearance of something under the microscope is … to describe a microscopical appearance, not to give a more accurate, better description of it" (221-2). The microscope only produces representations. As such, it enlarges the field of phenomenal objects and thus magnifies a chief insight grounding Peircean semiotics, the "fact that the entire universe," down to its

[194] See Wilson 251-4.

most minute elements, “is perfused with signs, if not composed exclusively of signs” (5.448).

The idea that the microscope is limited to the production of signs was generally used to fuel early anti-microscopy before and during its seventeenth century “golden age.” Microscopical experiments and conclusions forming the science were routinely cast aside as unreliable and subjective, dependent upon irreproducible illusions. As Vasco Ronchi has argued, philosophers before the early seventeenth century avoided optical instruments, reasoning that if the “purpose of sight is to inform us about how things are,” and “lenses show us objects larger or smaller, nearer or farther away, than they are in reality,” then they provide a distortion of reality, not a true picture. Thus, “if we want to pursue knowledge and avoid deceptions we should stay away from optical devices” (Wilson 215).[195] Throughout the eighteenth century, the appearances generated by the microscope were often presented in the strange contexts of “magic,” occasionally as “truth-revealing,” but usually as “truth-obscuring.”[196] Robert Hooke, one of microscopy’s most enthusiastic advocates, found himself needing to justify the “truth-revealing” potential of the microscope. He voices the opposition to magnifying lenses writing, “[it] is indeed … a great Argument directed against the Use of Telescopes, that there can be no Truth in the Discoveries made by them … that all the Appearances through such an Instrument are uncertain and imperfect, and real Misinformations, and consequently nothing but Phantomes and false Representations” (97).[197] Though Hooke remains confident that instruments of magnification produce images “equal” to those perceived by the naked eye, he is forced to concede a fundamental inconsistency between the reality of an object and its microscopical appearance. Contrary to his earlier commitment to the

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[195] The argument that Ronchi develops, and Wilson summarizes, appears in “General Influence of the Development of Optics,” and “Influence of the Early Development of Optics.” Wilson point outs, however, that Ronchi has been criticized by historians concerning his generalizations that the medievals “repudiated both natural and lens-assisted sight” (216). Ronchi tends to assume that the medievals failed to understand the “special conditions that produced illusions,” which led them to think that optical devices “invalidated the claims of any sense to general reliability” (216), an argument that Wilson describes as “doubtful and unsupported” (216).

[196] See especially Wilson 218. The doubts and criticisms of microscopy, as offering mere distortions of reality, did not, according to Wilson, “seriously challenge the assumption that the microscope was a truth-revealing instrument” (225) within the microscopical community itself.

[197] See also Wilson 216.

eye's veracity, his concession here is one that faults human perception rather than the instruments: "To answer this Objection therefore against the Truth of the Discoveries of Telescopes, and those of Microscopes, I say, that these Instruments do equally magnify the real Angle, under which any Object appears to the naked Eye … and that the Fallacy lies in the Eye and not in the Instrument" (98). Microscopes communicate misinformation and create false appearances, but only insomuch as intuition, or any direct perception of reality, is already prone to illusion. Though he once thought that the microscope "would take us down to the realm of philosophical essences" (Wilson 218), he found out that apprehension of this realm still required an infallible eye. As it turns out, our view of the subvisible world and its unique phenomena is no different than our view of the visible world, for, "[w]hat we see is always an appearance … [we] can only speculate … how the appearances are produced" (Wilson 219). Peirce's answer to this impasse regarding our understanding of and access to the microworld is that it is, like the macroworld, composed of and mediated by signs.[198]

My argument, then, suggests that the microscope fell out of serious scholarly favor between the latter half of the seventeenth century, its "golden age," and the early part of the nineteenth century, not only because of the aberration problems that were eventually solved by the achromatic lens, but also because early modern philosophy had no semiotic theory available to account for the representations produced by the microscopical view. Though the early moderns often saw the microscope as a kind of vehicle that might transport the viewer to a new world, replete with new structures and new landscapes, they ultimately found that this new world could give us no direct

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[198] Wilson concludes her study of the polemics associated with early microscopy by revisiting the question of the microscope's value in generating representations that may or may not successfully correspond to reality. She appears to land somewhere in the middle, stating,

> It is true … both that scientific apparatuses permit us to see more of the world as it really is and that they produce for us only an illusory image … although we seem at first thereby to be extending the domain of what can be clearly, distinctly, and immediately perceived, we are only forced again to extract meaning from the optically indeterminate. (256)

Her position is one voiced by Melville, who also saw the expanding field of view generated by the microscope not as an opportunity to extend our clear and distinct knowledge of the perceptible world, but as a means to "enlarge the field of our original and essential ignorance" (*John Marr and Other Sailors, With Some Sea-Pieces* 3). A larger field of vision, for Melville, merely increases the possibilities of misperception.

information about the objects composing the macroscopical, and thus saw the failure of the microscope as further affirmation of intuition. Accepting the microworld as non-contingently linked with the macroworld—or that communication between the two worlds is impossible, as Locke decided—amounts to a rejection of the challenge that the microscope presents: that external objects are *not* presented to the mind "clearly and distinctly." [199] As James Hoopes summarizes, the early moderns maintained a position that, "[w]hether the mind's ideas are true or false, the mind accurately and completely perceives the ideas as in themselves they really are" (6). But if the microscope tells us anything about a semblant object, it is that the object is never given "clearly," that a smooth surface is composed of non-continuous irregularities—those little mountains and valleys amongst which sentient animalcules thrive—that a thing is also a place.

The microscope thus generated a dilemma for early modern philosophers concerning the seemingly arbitrary relationship between the micro and macro worlds, a question which they had little success in solving. Peircean semiotics supplies an answer by rethinking, as Hoopes puts it, "philosophy's traditional problem of knowledge as it was defined in the seventeenth century by René Descartes and John Locke," both of whom share an inspired "confidence in one form of knowledge—self-knowledge, or knowledge of one's own thoughts" (6), that is, confidence that ideas are intuited clearly and distinctly. Redefining thought as signs allows Peirce to construct a semiotic theory that makes room for the microworld and that can account for the challenge the microscope put to direct intuition.

As is well known, Peirce advocated a semiotic composed of a triadic sign relation, where the *object* refers to the thing signified, the *sign* to the thought of the object (as yet without meaning), and the *interpretant* to the subsequent interpretation of the sign (that establishes its meaning). "[M]eaning lies not in the perception," as the early moderns might have it, "but in the interpretation of the perception" signaling the action of understanding. "Every thought," Hoopes clarifies, "is a sign without meaning until interpreted by a subsequent thought, an interpretant … [t]hus the meaning of every

[199] See Wilson 244 and my introductory chapter above regarding Locke's and Leibniz's attempts to explain the muted, differential gap between the macro and micro worlds.

thought is established by a triadic relation, an *interpretation* of the thought as a *sign* of a determining *object*" (7). Only by pointing to a further component of the sign, the *interpretant*, can a sign be called meaningful, can it even be recognized as a sign. As T. L. Short explains, "[s]ignificance is not a direct relation of sign to object; instead, the significance of a sign is determined by the interpretant which that sign elicits," and in this way the interpretant of a sign becomes "in every case … another sign of the same object" (215). The sign calls forth the interpretant to establish its meaning, and thus produces another sign which calls forth another interpretant, forming a signifying chain wherein "[e]very thought … interprets a preceding thought and is interpreted in a subsequent thought" (Short 215).

The semiotic offers a way to understand the connection between the macro and micro worlds that was not prevalent to the early moderns: the microworld is connected to the macroworld just as the interpretant is connected to the object as a sign. The microscopical calls the macroscopical into being as an interpretant, thus producing the next link in the chain of signification. This is appears to be what the microscope displays, in that each level of magnification stabilizes a single view, the meaning of which is dependent upon its relative context within the chain of ever increasing powers. As such, the semiotic accounts for both inductive reasoning—object to sign to interpretant—and deductive reasoning—interpretant to sign to object. To look through the microscope is, by necessity, to look at a part of the whole, to skip between levels of magnification and different views of the same object, disclosing endless views producing endless signs. The microscope thus suggests an infinite progression of views, if not by means of greater levels of magnification, then by the infinite lens combinations, angles, pieces, and appearances it produces; one level of magnification begets the next, one view begets another, the samples are endless. That is, to look through the microscope is to break into, to surgically cut into, to visually force open, the chain of signification.

Instead of assuming the incommunicability between the microworld and the perceptually semblant, what the early moderns termed primary and secondary causes, Peirce, armed with a moving semiotic, can see the representations produced by the microscope as part of a chain of signification; the telling of time, the face of a clock, and its inner mechanisms, are connected in so far as they are all signs. They are representations of the world connected by and through the interpretant. The interpretant names the “proper significant outcome of a sign” (5.473); the microworld and the macroworld, as themselves “perfuse with signs,” must likewise connect by means of the interpretant. Considering the formulation of the interpretant as a response to the microscope’s challenge to clear and distinct ideas, we can better understand Peirce’s semiotic as shaped by microscopical knowledge and, as such, how it might function microscopically, preserving the operations of endless points of view, powers of magnification, modes of reasoning, and, unquestionably, dissection.

That Peirce had the microscope in mind when formulating the interpretant is confirmed in an unpublished paper on “the kernel of pragmatism.” Here, he builds to his definition of the interpretant, as the “significant outcome of a sign,” by explaining the test used to determine contingency between related events as employed by the microscopist:

> when a microscopist is in doubt whether a motion of an animalcule is guided by intelligence, of however low an order, the test he always used to apply when I went to school, and I suppose he does so still, is to ascertain whether event, A, produces a second event, B, as a means to the production of a third event, C, or not. (5.473)

Whether event C can be said to influence the production of event B by event A is not exactly Peirce’s concern in this section. What he is interested in is how this test may apply to the action of signs, and his conclusion, to put it briefly, is that, at the very least, the intention of a third event (event C, an *effect* or *outcome*) must influence the production of the mental representation (the sign, event B) by the object (event A). The sign is produced *on the condition that* it will likely have a particular effect.[200] Another way to describe this action of the sign is to say that the *reason for the sign* has everything to do with the *existence of the sign*, which, considering the case outlined above concerning the logical unfolding of the universe and the affinity between mind and world as conditioned by instinctual reason, seems to fit within Peirce’s larger philosophical cosmology. And so defining the interpretant as the intended outcome of the production of

[200] See Aaron Wilson, “Peirce versus Davidson on Metaphorical Meaning.”

signs is brought about through application of a microscopical mode of engagement, the test employed by the microscopist who observes the world of subvisibilia.

A third way of describing the action of the sign, as a three-part logical outcome named by the interpretant, is that, as Peirce continues, "[t]he interpretant of a proposition is its predicate" (5.473). The predicate of a proposition is something that Peirce evaluates by means of grammatical dissection; so to say that the predicate becomes recognizable by dissection is to say that the interpretant, too, what is perhaps Peirce's most profound and influential contribution to semiotics, is likewise produced by means of dissection. In this way, Peirce's semiotic can be said to preserve the microscopical spirit of dissection.[201] Signs must produce additional signs like the microscope produces additional views, and can only be understood through dissection of these views just as the microscope dissects the semblant objects mistakenly taken as clear and distinct.

But Peirce's semiotic not only simulates the microscope in these ways, it also brings forth an incidental feature of it in that the instrument reveals a single object, or any particular sign, as itself composed of infinitesimal views. Peirce's semiotic operates both between signs in the chain of signification as well as within the particular signs themselves. In this way, it affirms his insight that "the universe is perfused with signs" (5.448) while making available a novel field through which the semiotic may advance. Communication between the microworld and the macroworld is impossible when the connection between the two is considered in terms of "qualities." But, when the connection is thought of as the interpretation of representations, where the truth of a sign and all its contingent expressions become mutual approximations of an always moving chain of signification, then meaning becomes one of negotiation rather than generalized abstraction. The microscope had everything to do with this shift from immutable qualities to approximations, as "the early modern epistemology of immediate apprehension [gave] way to one of negotiated meaning" (Wilson 218). Peirce's semiotic provides a means to account for microscopical representation as it dismantles direct intuition.

[201] One can observe the spirit of dissection operating in Peirce's semiotic when one looks at how minutely he classifies types of signs, objects, and interpretants into: icons; indices; symbols; dynamic objects; immediate objects; emotional interpretants; energetic interpretants; logical interpretants; and so on.

As an extension of the eye, the microscope still lays claim to a physiological access to reality. Though objects are not apprehended clearly and distinctly, they are, nonetheless, apprehended as a kind of material. That is, use of the microscope still invokes a looking out into the world for verification, and thus performs Peirce's strong preference for realism—he calls himself a "scholastic realist of a somewhat extreme stripe" (5.470). His conclusion, that "all thought … must necessarily be in signs," follows from the premise that "only by external facts can thought be known at all" (5.251). Peirce agrees with Emerson on this point, who likewise sought to confirm a natural correspondence between mind and reality. Thinking, or, the production of signs, is a natural process; reason is instinctual, the forming of beliefs habitual. And though Peirce would agree with Emerson that there is certainly a material existence to signs—Language as "fossil poetry" ("The Poet," *W* 3:22)—he would not share the opinion that this existence is a manifestation of a supreme spirit that has, in itself, no materiality.

As argued in the previous chapter, Emerson makes clear a connection between one's view of the world and one's understanding of it as part and parcel of a shared epistemology. For Emerson, this position resulted in the privileging of the symbol as linked with a distinctly macroscopical mode of viewing generated by his resistance to microscopy. Peirce similarly puts forward the position that modes of viewing are inseparable from the understanding, but his acceptance of microscopy leads to a different figurative preference: a dissected universe, Peirce must have concluded, is a metonymic universe. The process of signification, the dissected triadic sign, culminates in a chain wherein each sign points outside of itself to an interpretant which becomes another sign, and so on. The symbol alone cannot contain the variation generated by the dissection and production of signs. There can be no common referent in Peirce because his semiotic is not contained by deduction from an immaterial conception of the whole. Instead, he works out a chain that reproduces itself from out of its particulars linked by the interpretant that calls new signs into being.

If we agree with Peirce's reevaluation of truth as mutable, as the fixation of belief, and the nature of abstract, general laws as mere approximations of an evolving universe, then perhaps we can see that Hooke did not realize the potential of his "discovery" that the microscope would not reveal philosophical essences, or the single law to which all symbols commonly refer. The microscope does not reveal truth, not because it provides inadequate and distorted appearances, but because it discloses that, at bottom, truth as such is merely an approximation, the slowing down of additional signs metonymically producing an endless chain of signification. Truth as such is not there to be found because it does not exist:

> At any moment we are in possession of certain information, that is, of cognitions which have been logically derived by induction and hypothesis from previous cognitions which are less general … and so back to an ideal first, which is quite singular and quite out of consciousness. This ideal first is the particular thing-in-itself. It does not exist *as such*. (5.311—Peirce's emphasis).

Interpretation does not settle on the object, it cannot stop at the thing-in-itself, the thing *as such*, the absolute signified, but instead must move on endlessly, just as increasing levels of magnification display endless views of a single object. Saying that the universe is "composed exclusively of signs" (5.448) amounts to saying that the universe is a process of signification amongst object-sign-interpretant, resulting in a predominate metonymy. While resistance to the microscope led Emerson to symbolism, acceptance leads Peirce to metonymy.

Peirce's employment of microscopical knowledge reveals a two part evaluation: firstly, that the microscope must be understood as preserving a way of engaging with the world, characterized by dissection, particularity, induction, and metonymy; secondly, that his semiotic must be understood as microscopical, that without the microscope and the challenges it put to traditional metaphysics and early modern epistemology, the semiotic would not have been formulated in this way. The success of the instrument depends on reworking those conceptions of truth—as immutable, universal, and macroscopical—which means rethinking the problems of knowledge and perception as mediated by signs.

However, the microscopical knowledge found in Peirce's works also reveals an aspect of his science that is much less revolutionary, and much more difficult to swallow. Defining transcendentalism as a kind of "virus" "disseminated" from "minds stricken with the monstrous mysticism of the East" (6.102) indicates an attitude historically associated with Western science that Peirce clearly accepts *a priori*—that the East is incapable of scientific thought. This passage from "The Law of the Mind," which I have argued displays Peirce's assumption of medical microscopy, additionally displays a racist ideology that non-Western thinking is inferior, impure and diseased, and must be disinfected by means of Western science. Though he clearly attacks Western metaphysics, crafting perhaps the most comprehensive and persuasive argument against the trappings of metaphysical philosophy to his time, he fails to complete the project, a point that becomes increasingly obvious when we question that which *does not* receive microscopical scrutiny. What is painfully missing from Peirce's thoughts on the microscope—indeed, his collected works—is a microscopical examination of social and political institutions.

While Peirce was not unaware of such social and ethical concerns associated with scientific investigation, he nevertheless tended to disregard them. This course of action bespeaks his biography, especially his anxiety of being drafted into the Union Army.[202] Peirce biographer Joseph Brent points out that later in life Peirce said that "he did not feel the case for or against slavery very strongly, and that he sympathized with the strong pro-slavery views which made his father so distasteful among abolitionists" (61-2). And Peirce scholars have not ignored the lack of political writings. Roger Ward, for example, makes the case that the "success of Peirce's philosophy depends on the community becoming real," and that "Peirce's pragmatism demands a politics," but that "[s]uch a politics will have to be drawn out of Peirce's thought … since he does not present his ideas in terms we recognize as political" (68).[203] Peirce is not so much morally

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[202] Peirce's only reference to the Civil War appears in a letter he wrote to Alexander Bache: "Does my appointment in the [Coast Survey] service exempt me from draft or not? ... The town has just raised a full company, tho' considerably above its quota. But I perfectly dread going. I should feel that I was ended & thrown away for nothing" (qtd. in Brent 61).

[203] Perhaps his avoidance of the political results from his "scientific correction" of philosophy's inability to separate itself from practice. The explicit resistance to utility and intention that defines his scientific method, an argument both necessary to justify biological dissection, and surprising, when considering the very ethos of pragmatism, easily leads to an inability to ethically reassess social *a priori* categories. Tracing his scientific lineage to Aristotle's Asclepiadic training includes a commitment to separate philosophy from practice as dissection serves to distinguish Aristotle from Socrates, Plato, Cicero, Seneca, Pliny, Plutarch, and Lucian, those "narrators" who espoused the attitude that philosophy and practice are one (see 1.618ff). His argument is that if philosophy is to be brought "to a condition like that of the natural sciences" (5.413), it must rid itself of ulterior motives, along with concerns regarding utility and moral integrity, such as making money or benefiting mankind (see 1.44ff). He argues, for example, that

ambiguous as politically vacant, an interpretation suggested by the lack of any serious political writings. Although Peirce can dismantle *a priori* categories of whole and particular, rationality, logic, and language, he cannot dismantle the *a priori* categories of race that defined his era.

Emerson the philosopher resists the microscope in order to better uphold metaphysical thinking; Peirce the scientist employs the microscope to dismantle metaphysics, but he cannot, as scientist, apply the normative conclusions to social institutions, and consequently maintains a metaphysics of race. Melville, the artist, the language-worker, and the most scrupulous of anti-metaphysicians, fully realizes the potential of microscopical ideas by using them to dismantle all *a priori* categories, including the philosophical, the social, and the linguistic. To look microscopically is to dismantle, to untie, semblant figurations mistakenly taken as truth; the microscope offers, according to Wilson, "only a series of unconnected views" (231) of a single object that presents the viewer not only with innumerable signs, but also with an empty space between the semiotically linked levels of magnification. It would seem that the Peircean answer to this empty space is that it is yet another sign. But it also seems to be different from other signs, as it is impossible to trace this sign to any material existence. Additionally, the space cannot be said to be a purely mental phenomena in that it is still something objectively magnified by the microscope. Peirce had revised Emerson by bringing the microscopical mode of vision to bear on his totalizing metaphysics. But the microscopical view can be pushed further by investigating this empty space that appears

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> the true scientific investigator completely loses sight of the utility of what he is about. It never enters his mind. Do you think that the physiologist who cuts up a dog reflects, while doing so, that he may be saving a human life? Nonsense. If he did, it would spoil him for a scientific man; and then the vivisection would become a crime. (1.619)

Peirce makes clear the necessity of the scientist to rid himself of worldly, political, and ethical concerns in order to enact his method and conduct his operations. This characterization of the scientist easily leads to ambivalent interpretations: on the one hand, scientific and philosophical investigation ought not to be determined by pre-established motivations influencing desired results. Too often this practice encourages prejudiced interpretations and manipulation of data. On the other hand, the statement implies a willing neglect of moral scrutiny, the refusal of a program of values from which to check scientific practices. This seems to me to be a chief concern of humanities scholars critical of scientific practice, as well as a regular character type in fiction: the ethically void scientist who "goes too far," sacrificing integrity, and often human lives, in the name of "science." (*Frankenstein* might be the best example, but there are countless other works that one might choose).

to connect the otherwise unconnected views of the same object. The role that this empty space—that is equally magnified by the microscope—plays in the construction of language is, perhaps, not a question answerable by science. It is a question that I find operating throughout Herman Melville's fiction, and that receives its finest treatment in his disruptive and violent novel "Benito Cereno."

Chapter 3.

"Upon a still nigher approach": Melville's Microscopical Vision

I have argued that the rise of the microscope challenged categorical metaphysics, the tradition of privileging whole to particular, and the self-evident status of the thing. The microscope disclosed a naturalistic chaos that threatened to dismantle the spiritualistic mystery thought to manifest in objects of immediate perception. It also provoked philosophers, theologians, and scientists to reconsider the possibilities of communication between the microworld and the world of the semblant, as they compared the distance between the two worlds in an attempt to make sense of the assumed artificial space that exists between objects with themselves. This apparent inability to communicate with the microworld led to its attempted assimilation into the established macroscopical figurative system; as described above, the microscope "brought into being new phenomena … and when they could not be fit into preexisting systems, then systems were made around them" (Wilson 252). The danger, of course, lies in the power to manipulate this symbolic exchange; and this danger, I argue, is what Melville recognized in his departure from transcendentalist idealism, an idealism displayed in Emerson's dismissal of the microscope and its related mode of perception that I call "microscopical vision." The breakages of surfaces witnessed through microscopical scrutiny manifests in figurative hierarchies—canons and codes of meaning—that endorses itself as macroscopical placidity. "Benito Cereno" marks Melville's attempt to navigate the inherently disruptive quality of the literal, the differential gap that structures perception and its signification, the microscopical chaos upon which figuration uncomfortably rests.

Emerson and Melville

Emerson's ambivalence towards the information conveyed by the microscope discloses certain philosophical prejudices nascent to his transcendental idealism that exemplifies the shift in nineteenth century thinking towards natural science. His deriding of the microscope as a “plaything of the dilettante” displays not only his unwillingness to consider the philosophical potentials of microscopical knowledge, but also the stakes of his transcendentalist positioning, such as the upholding of essentialist/macroscopical perception that overlooks the importance of the particular in questions of a metaphysical nature. Recognition of these prejudices, I will argue, is at the forefront of Melville’s “Benito Cereno.”

I am drawn to Melville, here, for two chief reasons: first, his relationship with Emerson and the distinction between the two thinkers is one informed by the polemics generated by microscopical vision; second, I find in Melville a precursor for the currents in contemporary literary theory concerned with these microscopical ideas. As Emerson’s dismissal of the microscope suggests, the acceptance of the instrument and the ideas it sustains puts pressure on the kind of New England transcendentalism popularized by Emerson. Scholars have certainly discussed Melville’s opposition to transcendentalism and Emerson’s philosophy as his works have been neatly categorized as overtly symbolic and allegorical. However, most accounts concerned with the Melville/Emerson relationship fail to consider Melville as the kind of thinker and writer for whom current trends in literary theory, with their considerations of particularity, artistic form, object studies, and the literal, might find as a suitable predecessor. Scholarly appropriations of Melville as a brilliant symbolist tend to neglect his literality and his ambition to represent the phenomenality of peripheral surfaces, and consequently confine his works to a smaller field of literary appreciation.

Much of the scholarship concerning the Emerson/Melville relationship defends the premise that Melville was actually influenced by Emerson and his New England contemporaries in the first place, at least as much as he was by those more identifiable works of antiquity permeating his novels. In *Melville’s Reading*, Merton M. Sealts, Jr. chronicles Melville’s reading history to determine what sources he may have drawn from or had been most concerned with when composing each of his works.[204] Through records

[204] Merton M. Sealts, Jr.’s *Melville’s Reading* has become the standard study of Melville’s reading background, including his personal and family collections, his memberships and visits to a series of libraries in New York, his books obtained abroad, and those borrowed from close friend Evert A. Duyckinck, among others. Sealts also relates some of Melville’s more significant marginalia and personal

of Melville's acquisitions from libraries, friends, and book stores, his conversations with Evert A. Duyckinck and Nathaniel Hawthorne, and his written marginalia, Sealts demonstrates Melville's assumption of transcendentalist thought and his interest in Emerson and Thoreau.[205] For instance, Melville had borrowed from Duyckinck a copy of Thoreau's *A Week on the Concord and Merrimack Rivers* in the summer of 1850, a borrowing that Sealts speculates as a possible "follow-up to his earlier reading of Emerson" (61) which had gained momentum the year prior.[206] More recently, the scholarly literature regarding Melville's relationship to Emerson has developed—since now the connections have been established and most agree that Melville took more than a passing interest in New England transcendentalism—to question the consequences of Emerson's influence and to locate where in Melville's texts this influence may be felt. Some scholars want to rescue transcendentalism by means of Melville, others argue to define Melville as the first "post-transcendentalist" thinker.[207]

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correspondences, as well as the status of Melville scholarship whose suggestions often depend on discerning the author's readerly correlations. For instance, Sealts reports the findings of Howard P. Vincent and Luther S. Mansfield, editors of the 1952 Hendricks House edition of *Moby-Dick*, who, when discussing "Melville's more general reading," claim that, "Shakespeare perhaps had the most profound impact" (70). However, "Far outranking all other books in its all-pervading influence," Sealts reports, "was the King James version of the Bible, which Melville read and reread, annotated and marked in more than one edition" (70).

[205] Sealts adds to the established acknowledgment of Platonic, Biblical, and Shakespearian influences on Melville a large number of recognizable sources of inspiration, including: Edmund Burke; Montaigne; Byron; Wordsworth; Coleridge; Carlyle; Goethe; and Schiller (see Sealts 70-1).

[206] From August 1850 to November 1851, Melville lived in Berkshire, which led to the blossoming of his friendship with Nathanial and Sophia Hawthorne. Melville spent many evenings at the Hawthorne's, where the two authors, as a journal entry written by Hawthorne describes, would converse passionately about "time and eternity, things of this world and of the next, and books, and publishers, and all possible and impossible matters" (qtd. in Leyda 1:419). Sophia had noted Melville reading "Mr. Emerson's Essays," which Sealts thinks was most likely *Representative Men*, and on a later occasion, in March 1851, "the two men evidently discussed Thoreau, whom Hawthorne had known in Concord" (Sealts 67).

[207] Generally speaking, scholarship concerned with Emerson's influence on Melville usually attempts to uncover those instances where Melville satirizes or condemns transcendentalism. The "Mark Winsome scene" in *The Confidence Man*, for example, is often read as Melville's portraiture of Emerson and Thoreau ("Mark Winsome" and his disciple "Egbert," respectfully), where the mystic Winsome spurns a beggar "peddling a transcendental tract" and is later criticized for the "heartless nature" of his "cold philosophy" (Smith 330). What is often extrapolated from this scene is Melville's view of transcendentalism as a philosophy that is more concerned with commerciality than personal suffering, linking "self-reliance" with "economic individualism." Carl Van Vechten has claimed that *The Confidence Man* is Melville's "great transcendental satire" (421). Similarly, Howard P. Vincent insists that "*Moby-Dick* is a satire of New England Transcendentalism" (8).

Chapter thirty-five of *Moby-Dick*, "The Mast-Head," has also received particular attention for its coded portrayal of Emerson's transcendentalism. After warning Nantucket ship-owners from enlisting any

Melville is typically read as scornful of Emerson's transcendentalism and, though recent scholarship has objected to this position by discouraging both "anti-Emerson" and "pro-Emerson" approaches to Melville's fiction, it is the evaluation of the literal that I read in "Benito Cereno" that displays for me a serious, if not decisive, difference, specifically as the location of the disruption of figurative hierarchies like those Emerson depends on when considering his theory of symbolism.[208] The purpose of referencing the

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"sunken-eyed young Platonist" (135) disposed to absent-minded meditations for mast-head duty, Ishmael closes the chapter with the following:

> But while this sleep, this dream is on ye, move your foot or hand an inch, slip your hold at all; and your identity comes back in horror. Over Descartian vortices you hover. And perhaps, at mid-day, in the fairest weather, with one half-throttled shriek you drop through that transparent air into the summer sea, no more to rise for ever. Heed it well, ye Pantheists! (136)

Bryan Wolf, who argues that Melville "despaired over Emerson's apparent inability to acknowledge evil," interprets this scene as a "parod[y] in cautionary fashion the plight of the budding transcendentalist" (147). Ishmael's transcendentalist, prone to such abstractions, consequently plunges to his death, and thus, for Wolf, "presents us with an extreme version of Emersonian innocence, a state of mind that expands consciousness only by diminishing the material world and the dangers it contains" (147). Many scholars, such as Bradley Johnson and Michael Paul Rogin, would agree with Wolf's reading and highlight this scene as evidence for Melville's position against transcendentalism as a philosophy that unjustly privileges the mind to the body.

See especially: Edward Rosenberry, *Melville and the Comic Spirit*; John B. Williams, *White Fire: The Influence of Emerson on Melville*; Michael McLoughlin, *Dead Letters to the New World: Melville, Emerson, and American Transcendentalism*; Paul Smith, "The Confidence-Man and the Literary World of New York;" Sidney P. Moss, "'Cock-A-Doodle-Doo!' and Some Legends in Melville Scholarship;" Hershel Parker, "Melville's Satire of Emerson and Thoreau: An Evaluation of the Evidence;" Carl Van Vechten, "The Great Satire of Transcendentalism;" Howard P. Vincent, *The Trying-Out of Moby-Dick*; Bryan Wolf, "When is a Painting Most Like a Whale?: Ishmael, *Moby-Dick*, and the Sublime;" Bradley A. Johnson, "Mind in the main-top, body in the bilge: space and the human form in Melville's *White-Jacket*;" and Michael Paul Rogin, *Subversive Genealogy: The Politics and Art of Herman Melville*.

[208] See, for example: William Braswell, "Melville as a Critic of Emerson," where he discusses how Melville's lack of familiarity with transcendentalism hardly qualifies him to pass serious judgment; and Ramon Espejo Romero, "Negotiating Transcendentalism, Escaping 'Paradise': Herman Melville's *Moby-Dick*," in which he argues for the contradictory nature of transcendentalism, the movement's lack of homogony, and which serves as a good example of a non-confrontational attitude towards examining Melville's Emerson. These and other critical appraisals of the Emerson/Melville relationship tend towards the non-oppositional, or the knowledgeable and respectful acceptance by Melville of Emerson's thought, and thus discourages any "anti-Emerson" or "pro-Emerson" approaches to Melville's fiction. Two primary sources have generated this tendency to read Melville as scornful of Emerson's transcendentalism: first is a letter addressed to Evert Duyckinck dated March 3, 1849, written shortly after Melville attended a lecture given by Emerson; and second is a series of marginal comments scribbled throughout Melville's copies of Emerson's *Essays: First Series*, *Essays: Second Series*, *The Conduct of Life*, and *Poems*. Melville's letter, though not purportedly fictional, is nonetheless as complex as his novels, with ambiguous metaphors and value judgments. Here, Melville calls Emerson a fool, but adds that he'd "rather be a fool than a wise man" (79). He calls Emerson a "humbug," but "no common humbug" (78). He applauds Emerson's intelligibility, and, most importantly, his willingness "to *dive*" (79), to philosophize in a risky fashion, an opinion confirmed by his consistent marginal commentary commending Emerson's "noble" essays. We should note, however, that even when Melville compliments this practice of philosophers "to dive" that he sees in

debate concerning Melville's opinion of Emerson is not merely to display Melville's personal opinion of the "Sage of Concord"—as a "humbug," or as a "brilliant fellow"—but to examine whether or not the usual markers of difference (self-reliance, the danger of totalizing schemes tending towards absolute good, the force of ignorance, and the privileging of the whole over the part) contain similar operative concepts formulating the microscope's epistemology, and thus may help define a logic at work in Emerson's symbolism that Melville challenges.[209]

As discussed at the conclusion of chapter one, the view of the natural world as construed by the microscope especially challenges Emerson's theory of symbolism. Emerson's correspondence theory reflects his idealistic, macroscopical, and organicist world view. It levels particular things to a common referent—Spirit—and eliminates ambiguity and contradiction from symbols. Consequently, the theory drains the rhetorical force from figures of speech like sarcasm and irony that disrupt the agreements between referent and expression rather than confirming and reproducing them. In this way, the view made available by the microscope, in its revealing of the chaotic microworld thriving beneath the visible and the non-homogenous nature of substance, works against Emerson's abstract and metaphysical theory of language which actively promotes a "macroscopical" mode of viewing. The microscope, an instrument that can never return its gaze to contemplation of the whole, becomes for Emerson a false justification for the ignorant dwelling within partiality; because "truth" equates with recognition of one's role

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Emerson, he is sure to point out, "I'm not talking of Mr. Emerson now—but the whole corps of thought-divers" (79). The letter begins negatively: "Nay, I do not oscillate in Emerson's rainbow, but prefer rather to hang myself in mine own halter than swing in any other man's swing" (78); and concludes dismissively: "But enough of this Plato who talks thro' his nose" (79).

Melville's marginal comments, which have been collected by Walker Cowen in his two volume thesis *Melville's Marginalia*, are ambivalent as well. Melville noted some passages with cheers, like "True & admirable. Bravo!" (1.520) and "Bully for Emerson!–Good!" (1.521) as well as praise like "All this is nobly written, and proceeds from noble thinking, and a natural sympathy with greatness" (1.526). But the criticisms appear to outweigh the applause. Melville found Emerson's inability to recognize evil particularly frustrating; especially in passages where he thought Emerson insinuated that man himself is responsible for the origin of his own ills. Next to a passage from "Heroism," for example, Melville wrote: "Look squarely at this, & what is it but mere theology?–Calvinism?" (1.522). What Melville saw in Emerson's inability to recognize evil was, as Braswell argues, "a universal scheme that tends toward absolute good" (329), along with the danger of totalizing hierarchies such schemes invariably entail. There are many other disparaging annotations leveled at Emerson throughout Melville's copies, usually regarding the status of the individual, the body, and the recognition of evil.

[209] See Melville's "Letter to Evert A Duyckinck, 3 March 1849."

within the Over-Soul, the microscope, as a magnifier of particularity, can only magnify ignorance.

This idea, that the microscope enlarges ignorance as much as knowledge, was one that both Emerson and Melville shared. In terms of the forcefulness of ignorance, or the negative influence ignorance undeniably has on the political functioning of society, the microscope serves as an interesting point of both commonality and divergence between Melville and Emerson—common in that they agree that the microscope amplifies ignorance, divergent in their reasoning for why this is the case. For Emerson, on the one hand, the microscope fosters ignorance by promoting a mode of viewing the world inconsistent with totality, thereby obscuring (by keeping from view) the absolute, aggregate truth. That is, ignorance means separation from the Over-Soul, and the microscope, motivated by detachment or dissection, can never bring one to transcend the particular to account for the whole; one takes the farm for the landscape.

On the other hand, Melville understands the widening of ignorance consequent of microscopy not as a distortion of a proper macroscopical or totalizing mode of viewing, but from enlarging the field of vision itself, which ultimately emphasizes our inability to directly perceive the natural world. In the "Inscription Epistolary to W.C.R." that introduces *John Marr and Other Sailors, With Some Sea-Pieces*, a collection of poems printed by the De Vinne Press in 1888, Melville describes how the "penetrative perspicacity" of his "companionable acquaintance" Hilary may have developed from Hilary's business as an optician:

> for he is an optician, daily having to do with the microscope, telescope, and other inventions for sharpening and extending our natural sight, thus enabling us mortals (as I once heard an eccentric put it) liberally to enlarge the field of our original and essential ignorance. (3)

Melville derides the microscope in a similar fashion as does Emerson, pointing out how the invention that is supposed to sharpen and extend natural sight, and thus bring us closer to the natural world in order to obtain a more comprehensive knowledge of it, ends up turning this "knowledge" back on to the viewer, revealing his or her essential ignorance. But for Melville, it is not that the microscope is an improper way of viewing any more than natural sight is, but that, as essentially ignorant beings prone to error, enlarging the field of vision means enlarging the possibilities of misperception. The logic at work here is ambiguous. The privileging of one mode of viewing—i.e. the poetic, or macroscopical, for Emerson—risks an undemocratic totalization that dismisses the material world populated by people and things in favor of transcendentalist abstraction.[210] However, the inclusion of all possible views—i.e. macroscopical, telescopical, microscopical, etc.—does not ensure cohesion, but rather amplifies irregularity and the impossibility of knowing the world.

Ignorance and evil are intimately linked concepts that scholars often stress when distinguishing Melville from Emerson. The ways in which Emerson and Melville understand the microscope as indicative of a logic concerning the power of ignorance parallels their confrontations with the problem of evil. For Emerson, evil is a consequence of ignorance that may be corrected by altering the focus of one's vision from the particular to the whole—an argument he likely learned from Plato. The microscope is not a correction of vision, but further distortion, and thus enlarges ignorance by endorsing a partial way of viewing. Melville's take on how the microscope enlarges ignorance similarly speaks to his understanding of evil: just as the field is enlarged, so is evil ever expanding and pervading—even Billy Budd could not avoid the devil's hand.[211]

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[210] Consider again the passage from chapter thirty-five of *Moby-Dick*, "The Mast-Head," which, in Bryan Wolf's words, presents to the reader a transcendentalist world where "unity is so facile an achievement that the eye forgets the perils to which the body is subjected" (149); where, as Bradley Johnson argues, "For both Ishmael and White-Jacket, transcendental thought unnaturally privileges the mind to the detriment of the body" (247); or, as Michael Paul Rogin puts it, "This 'pantheist' resymbolizes nature, but as he does so the object world dissolves. … The sailor's vague, pantheist conceptions do not free him from his very limited, very clear body. His body betrays him, his foot slips, and his 'identity comes back in horror' as he drowns" (110).

[211] Melville describes the all-pervasive character of evil in "Billy Budd": "Though our Handsome Sailor had as much of masculine beauty as one can expect anywhere to see; nevertheless, like the beautiful woman in one of Hawthorne's minor tales, there was just one thing amiss in him. No visible blemish, indeed, as with the lady; no, but an occasional liability to a vocal defect. Though in the hour of elemental uproar or peril he was everything that a sailor should be, yet under sudden provocation of strong heart-feeling, his voice otherwise singularly musical, as if expressive of the harmony within, was apt to develop an organic hesitancy, in fact, more or less of a stutter or even worse. In this particular Billy was a striking instance that the arch interferer, the envious marplot of Eden, still has more or less to do with every human consignment to this planet of earth. In every case, one way or another he is sure to slip in his little card, as much as to remind us—I too have a hand here" (111).

The “microscopical view,” as I have earlier defined, is one that questions the placidity of the whole by emphasizing the status of the particulars composing it; it is a view that challenges the transcendentalist tendency towards macroscopical abstraction while it discloses the incredible distance between the objects of nature and our understanding of them. The “macroscopical” or “landscape” view is, for Emerson, the mode of perception that best reveals the symbolic structure of nature, where symbols are defined as manifestations of Spirit directed by and reproducing the Over-Soul. Melville, on the other hand, by taking on a mode of viewing similar to the microscopical, throws Emerson’s theory of symbolism into question on two fronts: firstly, by suggesting that relations of power, and not the Over-soul, determine symbolism—thus marking symbolism as the reproduction of hierarchical and prejudiced codes of meaning—and secondly, by illustrating how Emerson’s theory does not account for the empty space that organizes symbolism prior to its interpellation into the symbolic order—what I call the “literal”—that ultimately disrupts the reproduction of power determining symbolic exchange. The microscope not only magnifies objects, but also the empty space that emerges between levels of magnification. Emerson, promoting an exclusively macroscopical mode of vision, one that he defines against the microscopical, is unable to see the empty space that the microscope reveals and that the literal names, the space between two powers of greater magnification, the single breath between “Landor despised entomology” and “the sublime was in a grain of dust” (*W* 5: 9).

“Benito Cereno” and Microscopical Movement

Melville’s “Benito Cereno” is notoriously difficult to discern. One of the many reasons for this is the metacritical quality of the story being one that questions what it means to *discern* a thing in the first place. It is a story of distinction, and of division. It is about the recognition of difference and discrimination, and it is invested in navigating the process of perception to ‘make out,’ behold, descry by “express powers of vision,” how one mentally separates one thing from another.[212] Melville spotlights the process of

[212] “discern, v.” *Oxford English Dictionary Online*.

literacy in “Benito Cereno” as he recognizes the powerful operations of signification and their role in perception.

The opening sequence indicates the story’s investment in scrutinizing perception while indicating the kind of movement the microscopist undergoes when examining an object with increasingly higher powers of magnification. We recognize instantly that Captain Delano’s first view of the San Dominick—the strange ship on which the greater part of the plot is set—is one mediated by a spyglass, suggesting a variable perception conditioned by relative viewpoints. What Delano sees, and is surprised by, is that the stranger “showed no colors” (35), a reference to the fact that the approaching ship was flagless, a symbolic moment that many scholars read as Melville’s coded method of de-nationalizing, and thereby outlawing, the San Dominick. Melville describes the atmosphere “seen through the glass” when he writes, “Everything was mute and calm; everything gray” (35), thus tightly winding color imagery with voicelessness, two of the story’s prominent motifs.

Scientists and philosophers engaged with microscopy regularly debated theories of color. Consider the passage from Locke’s *An Essay Concerning Human Understanding* cited above, where he argues for a muted differential space that borders the worlds of visibilia and subvisibilia and blocks any real communication between the microworld and the perceptually semblant.[213] This passage refers to the philosophical and scientific discussions of color that were enlivened by the enhanced optics of the microscope: “If that most instructive of our senses, seeing, were in man one thousand … times more acute than it is by the best microscope. … I doubt, whether he, and the rest of men, could discourse concerning the objects of sight, or have any communication about colours” (403). Locke, when criticizing Robert Boyle for thinking that the microscope

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[213] The following passage from Locke’s *An Essay Concerning Human Understanding* is examined in the Introduction (23):

> Nay, if that most instructive of our senses, seeing, were in any man a thousand or a hundred thousand times more acute than it is by the best microscope, things several millions of times less than the smallest object of his sight now would then be visible to his naked eyes, and so he would come nearer to the discovery of the texture and motion of the minute parts of corporeal things … but then he would be in a quite different world from other people: nothing would appear the same to him and others … so that I doubt, whether he and the rest of men could discourse concerning the objects of sight, or have any communication about colours, their appearances being wholly different. (403)

would allow us to understand the composition of color, argued that relationships between primary and secondary qualities of objects prohibit such understanding. Boyle regarded color as a tangible feature of the surface texture of an object, claiming that when viewed through a microscope one could discern the variously colored granules composing and determining its outward appearance.[214] And yet, even Boyle had pointed out that, in Wilson's words, "the microscope does not intensify the colors of ordinary experience but fades them. Opaque bodies grow transparent; blood grows gray" (231). What happens to color when the world is viewed through the microscope? Everything turns gray.

The grayness permeating "Benito Cereno" is thus indicative of microscopical vision; the scrutiny of perception influenced by glass is one that seems to erase as it blends colors, further suggesting the blending of ideological connotations aligned with such imagery, that is, it blends produced (or figurative) racial identities that serve as substitutable images linked with blackness or whiteness in place of reality. The "spyglass opening" of the novel suggests this microscopical vision in another important way as well, recognized in Melville's presentation of Delano's view—a view always connected with the Yankee captain's figurative associations—as the two ships begin to come together. Melville gives us three paragraphs displaying how Delano's perception is influenced by his subjective distance to the object under scrutiny that resembles stages of increased focus. The initial approach to the San Dominick is not a back and forth, but a consistent magnification that displays greater disruption consequent of perceptual clarity, rather than confirmation of macroscopical placidity. Delano's mate appears averse to the approach, but the naïve captain pushes on:

> Upon gaining a less remote view, the ship, when made signally visible on the verge of the leaden-hued swells, with the shreds of fog here and there raggedly furring her, appeared like a white-washed monastery after a thunder-storm, seen perched upon some dun cliff among the Pyrenees. But it was no purely fanciful resemblance which now, for a moment, almost led Captain Delano to think that nothing less than a ship-load of monks was before him. (36)

The flagless ship initially appears undisturbed to Delano, as unsoiled, freshly painted, and naturally washed. His macroscopical perception leads to associations of peaceful

[214] See Wilson 59 and 246.

monasteries housing tranquil monks. The placid white color imagery is consistent here, as Melville further conveys Delano's innocence and naïveté; whereas his mate recognizes danger in this ill-maneuvered ship, Delano's abstracted vision lies somewhere in the Pyrenees, suggesting his inclination towards the otherworldly transcendental.

The following passage continues the microscopical movement:

> Upon a still nigher approach, this appearance was modified, and the true character of the vessel was plain—a Spanish merchantman of the first class; carrying negro slaves, amongst other valuable freight, from one colonial port to another. A very large, and, in its time, a very fine vessel, such as in those days were at intervals encountered along that main; sometimes superseded Acapulco treasure-ships, or retired frigates of the Spanish king's navy, which, like superannuated Italian palaces, still, under a decline of masters, preserved signs of former state. (36)

The approach modifies the appearance, leading Delano to believe he can now discern the "true character of the vessel," described as "plain." But even such a "true" discerning is one laden with value judgments, as Delano thinks the ship "a very fine vessel," specifically in its preservation of signs indicating an aristocratic and royal history. This mid-level magnification of the ship correlates with the revelation of its disturbed state, but, as this vision is too mediated by Delano, its upset reality remains held at bay. Moreover, the word "plain" speaks to the in-between level of magnification as it demonstrates Delano's naïveté: to see something "plainly" is to see it "openly, without concealment;" something that is "plain" is "straightforward, factual," "simple or unadorned;" the word refers to an open or unobstructed field of view (hence the force of the expression "hidden in plain view"), which thus characterizes Delano's "plain" vision as ironic—there is nothing "plain" about this novel, nothing is given "straightforwardly." "Plain" also means "level, even, flat, free from elevations or depressions," or, "equal," and as such characterizes this passage as exhibiting a mean or average view, neither "too far" nor "too near." Also equalized, or made "plain," in this passage are Negro slaves with "other valuable freight," indicating that such a "plain" view is still composed of serious ethical oversights composing hierarchical order. Melville's choices of "superseded" and "superannuated" likewise display Delano's naïve conception of history as straightforward progression, devoid of its systemic oppression, while foreshadowing the unveiling of the revolution, as Cereno's position of power has been superseded or replaced by Babo's—the leader of the yet undisclosed slave mutiny—making untenable Delano's antiquated Yankee ideology.[215]

Finally, the sequence of the Yankee's approach to the slave ship concludes with another level of greater magnification:

> As the whale-boat drew more and more nigh, the cause of the peculiar pipe-clayed aspect of the stranger was seen in the slovenly neglect pervading her. The spars, ropes, and great part of the bulwarks, looked woolly, from long unacquaintance with the scraper, tar, and the brush. Her keel seemed laid, her ribs put together, and she launched, from Ezekiel's Valley of Dry Bones. (37)

What once looked peaceful from a distance now, upon closer inspection, appears dilapidated and slovenly neglected. It is important to note here that when Delano comes closest to the stranger, his points of interpretive reference are also altered. From the Pyrenees monastery, to the Italian palace, we now confront an image of the body. Melville's language here is infused with bodily signifiers, employing the anthropomorphic feminine pronoun "her," but most immediately in describing the "ribs" of the ship and referencing "Ezekiel's Valley of Dry Bones."[216] As Delano comes closest to the ship, he does not see through it, but rather sees only more surface, a surface that, at the end of the magnified movement, rests on the body. Again, the passage serves a foreshadowing function by its allusion to Ezekiel 37.1-14 (the "Valley of Dry Bones"), an allegory, also conveyed by bodily signifiers, of a prophesied spiritual redemption for the decaying Israel whose sins of slave ownership and injustice to the poor have resulted in God's punishment by means of Babylonian Captivity.[217] Melville seems to be likening his civilization, with its aggression and immorality devoid of justice and spiritualism, to a similar state of decay. The bone imagery, of course, is amplified when the skeleton of Alexandro Aranda, the former owner of the slaves, is revealed as nailed to the ship's figurehead.

The opening sequence displays how the story's form mirrors the experience of microscopical magnification. Melville's presentation of Delano's approach to the San

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[215] See "plain, n.1" and "plain, n. 2". *Oxford English Dictionary Online*.

[216] Melville had used the pronoun "her" previously to describe a ship, but it appears more pronounced here.

[217] See Mario L. D'Avanzo, "Melville's 'San Dominick' and Ezekiel's Dry Bones."

Dominick displays how perceptual focus is influenced and altered by one's relative placement, and the ideas nascent here—of color symbolism, hierarchical structures of power, disruption, and the individual body—are becoming increasingly relevant to the telling of the story. How one discerns has everything to do with what one discerns, but closer proximity does not necessarily entail greater clarity. Rather, we are even more mystified by the goings on of the San Dominick; we enter a different world that is not at all different, a world defined by an inability to communicate and the ambiguity of the color gray. This story about focus and perception given to us through a spyglass enacts a microscopical movement as it undoes a seemingly placid surface to reveal a surface composed of chaos, breakages, and further interwoven figurations. The developing magnification will eventually focus on the true captain of the San Dominick, Babo, but, prior to detailing my reading of Babo, I should first address a few of the novel's other important formal features, namely the deposition and the symbolism.

The Deposition

Much has been made about Melville's treatment of his source for "Benito Cereno." Harold H. Scudder was the first to show how the novel is based on the eighteenth chapter of Captain Amasa Delano's *Narrative of Voyages and Travels in the Northern and Southern Hemispheres*.[218] Since Scudder's discovery, and his comment that "[Melville] merely rewrote this chapter, including a portion of one of the legal documents appended, suppressing a few items, and making some small additions" (502), scholars have developed analyses of the novel with such theoretical import as to not only trivialize Scudder's strangely narrow reading of it, but also to extend beyond Melville criticism. What is the function of the lengthy deposition appended near the novel's conclusion?

Well, first we should probably ask what *is* the deposition appended near the novel's conclusion. After the mask is torn away and the true status of the San Dominick is finally revealed, the sealer wastes no time in subduing the mutinous ship. Avoiding the hatchets imprudently hurled by the uprising slaves, the strategic whites volleyed cannon

[218] See Rosalie Feltenstein, "Benito Cereno: From Source to Symbol."

balls, killing “nearly a score of the negroes” (88), and boarded the ship armed with long-edged sealing spears and cutlasses. No whites were killed. The fight scene is relatively short, fitted as it is between the story of Delano’s struggle of comprehension and the concluding deposition. This deposition comes from a translated extract “from one of the official Spanish documents,” and consists of Benito Cereno’s testimony, which the narrator hopes will “shed light on the preceding narrative” by revealing the “true port of departure” and the “true history of the San Dominick’s voyage, down to the time of her touching at the island of St. Maria” (89). While the narrator appears more concerned with seemingly trivial facts of the case—rather than with what readers of the story would undoubtedly view as more pressing concerns regarding slavery, revolution, systemic violence, etc.—he is quick to note that even the legal documentation of this eye-witness account is not to be accepted as the whole truth: “Some disclosures therein were, at the time, held dubious for both learned and natural reasons. The tribunal inclined to the opinion that the deponent, not undisturbed in his mind by recent events, raved of some things which could never have happened” (89).

The deposition then begins, first with the legalese of His Majesty’s Notary Public and then with the Declaration of the first witness, Don Benito Cereno. The narrator seems to leave the scene, but is still present, as he consistently interjects and informs the reader of the passages he has omitted and those he has extracted, filling in the gaps with brief summations. These interjections are typically signified by brackets that divide the passages composing the deposition. One example of the narrator’s continued presence in the form of bracketed interjection appears with the line, “Then followed various random disclosures referring to various periods of time” (98). The vagueness of these “various random disclosures” indicates a certain ambiguity between the text and the event referenced, the narrator all but admitting the incompleteness or sketchiness of this “legal document.” Another example appears immediately after the introductory passage. This passage recounts Cereno’s departure, and concludes with the following description: “the crew of the ship consisted of thirty-six men, beside the persons who went as passengers; that the negroes were in part as follows,” prompting the narrator to announce:

> [Here, in the original, follows a list of some fifty names, descriptions, and ages, compiled from certain recovered documents of Aranda's, and also from recollections of the deponent, from which portions only are extracted.] (90)

The deposition then catalogues the names and a few biographical particulars of several key players of the mutiny, including such data as birthplace, trade, and death, if applicable, leading to the next interjection, again in brackets: "[The catalogue over, the deposition goes on:]" (90). It also details the events of the mutiny itself, prior to the cover up operation enacted by Babo, and Babo's apparently ruthless treatment of captured Spanish sailors.[219] The deposition further chronicles the slave uprising, Babo's negotiations with Benito Cereno concerning their options and their attempt to reach Senegal, where they may stop for water, and other such details pertaining to the captaining of a large vessel. It uncovers the chief conspiratorial figures comprising Babo's plan upon Delano's entrance, such as: the role of the negresses and their desire to torture their master Don Alexandro; the hatchet-polishers, who were on call to use and distribute their weapons if needed; Atufal, who could drop his chains at any moment; and the four older lookouts who could pass messages along the ship's decks and maintain "what domestic order they could" (95). The deposition concludes with Cereno's admitting that he cannot recall each event that had passed because of the psychological hardships he underwent, but that what he has offered is "the truth under oath which he has taken; which declaration he affirmed and ratified, after hearing it read to him" (99).

What the deposition does, then, is attempt to retell the story in a way that resists value judgments and judgments of perception. That is, the deposition is not artistic, which many Melville scholars, like Richard Fogle, are quick to point out: "He stays close enough [to Delano's Voyages] to make 'Benito Cereno' unusually detailed and documentary in its treatment of fact. … Much of its concluding part is taken up with a court deposition, almost literally transcribed, so that it would be reasonable to judge … that the material has not been worked up into art" (117). As explicitly non-artistic as it can be, the deposition thus performs a certain claim to objectivity as well as consensus,

[219] Ruthless, yes, but not without cause; a slave uprising naturally includes violence, and may be justified when Babo, now ironically, said to Captain Delano, "Babo is nothing; what Babo has done was but duty" (45).

which is further confirmed in the narrator's introduction to the deposition when he tells us that, although Cereno's account may not be absolutely trustworthy due to his psychological state, the "subsequent depositions of the surviving sailors … gave credence to the rest" (89). The problem here is, of course, that although the surviving sailors are composed of several people, they can only really offer a biased account of the story. In a sense, the deposition does the work of the critic, by uncovering the subtextual layers of the conspiratorial figures, decoding the secret signs that a few sailors tried relaying to Delano, and providing the historical background it deems necessary for a satisfactory and complete interpretation. And by ending with reference to the formality of sworn testimony—to tell the truth "under oath"—the deposition acts as a mode of writing that may better authenticate reality, providing a more "truthful" representation. All of this makes the document appear as a stable verification of reality, thus serving as a foil to the story preceding it.

The deposition, as a non-artistic mode of writing ostensibly verifying an objective reality, stakes this claim by attempting to rid itself of perceptual judgments, which is recognized in its lack of figurative tropes—the kinds of symbols, imagery, and other patterns of coded meaning that the fictitious novel develops at length. To better understand how Melville manages this shift from the story to the deposition, I should briefly relate the theory of symbolism I find operating in "Benito Cereno."

On a Melvillean Theory of Symbolism; Moby-Dick *and* White-Jacket

"The symbols in this story offer special difficulties," Guy Cardwell tells us, "because many of them carry shifting, multiple values instead of values that are constant even though imprecise. Moreover, the entire congeries of major symbols is so interrelated and is so organic a part of the tale that a reinterpretation of one symbol may require a reinterpretation of all" (67). These especially difficult symbols have led many scholars to consider "Benito Cereno" one of Melville's lesser works, whereas others prefer it to works as well received as *Moby-Dick* and "Billy Budd," precisely because of its unassimilated symbolic character.[220] Some of the more conventional symbols include the lock and key, the ship as microcosm, and those indicating national allegiance, while others, like the color symbolism, the interest in nature, and the religious symbols, are so elaborate and uniquely Melville's own as to make specious any definitive pattern of meaning. Cardwell argues that the first set of symbols "retain their factual authority and convey expected meanings but are comparatively uninteresting," while the second set require greater scrutiny, for they are "responsible for much that is exciting, moving, and troublesome in the story" (68).

While I tend to agree with Cardwell that some of the symbolic occurrences in the text are perhaps charged with more complex meaning than others, I would argue that even these "conventional symbols" become increasingly intricate in Melville's writing. This is because Melville is working with an unconventional theory of symbolism, one that, though implicit, can be discerned in earlier novels like *White-Jacket* and *Moby-Dick*, and one that questions the relationships between figurative language, structures of power, and the status of the literal. To define this theory, I offer my reading, along with Starbuck, Stubb, Flask, Queequeg, Fedallah, and Pip, of the doubloon nailed to the Pequod's main-mast.

The episode needs little introduction: Ahab emerges from his cabin and gathers his men around the main-mast of the whaleship to announce their top priority of raising Moby-Dick. Ahab then procures from his pocket a "broad bright coin," a Spanish doubloon, and, upon receiving from Starbuck a hammer, proceeds to nail the sixteen dollar piece to the mast, exclaiming, "whosoever of ye raises me that same white whale, he shall have this gold ounce, my boys!" (138). The doubloon becomes "set apart and sanctified to one awe-striking end" (332), that of Ahab's will to slay Moby-Dick, to the point in which the sailors, who are otherwise ruthless and prone to stealing something so ready for the taking, "revered it as the white whale's talisman" (332), and thus kept their distance.

First, viewing the doubloon prior to Ahab's nailing it to the mast, it symbolizes a system of exchange, of commodities and consensus, determined not by the users of coins

[220] See Fogle 116.

as much as by a generalized group of people out of the public's reach, or, as Ahab puts it, "the accountants [who] have computed their great counting-house the globe, by girdling it with guineas" (139). The coin, as a monetary unit, is something that is circulated, and thus represents not only the exchange of commodity values, but also the exchange amongst people determining its value. By nailing the coin to the mast, Ahab usurps the authority of the "accountants." Taking the object out of circulation, he extracts from it its status of exchange and stabilizes its otherwise fluid meaning. That is, as long as the coin remains affixed to the mast, it cannot be used as a stand-in for sixteen dollars or "nine hundred and sixty cigars" (334), in Flask's estimation, or anything else for which it may be exchanged, but signifies only Ahab's vengeance—the "one awe-striking end." Furthermore, the coin "ratifies" Ahab's intentions in a pretended democratic consensus between he and his harpooners, turning his vengeance into law—"Yon ratifying sun" not only refers to the setting sun "sitting in" as an official "to ratify the day's deed, so that no one can repudiate the pact" (142), as *Moby-Dick* editors Hershel Parker and Harrison Hayford explain, but also to the coin itself, what Ahab later describes as a "coined sun" (332), hovering above the crew like a modern Code of Hammurabi. Nailing the coin temporarily suspends symbolic exchange.

The doubloon thus suggests that the status of a symbol is defined by some ungraspable power, "some unknown but still reasoning thing" (140), firstly as the coin's exchange value is determined by a monetary system not controlled by the individual user, and secondly in Ahab's usurpation of this exchange, substituting one authority (his monomaniacal captaincy) for another. Ahab's determination of the meaning of the doubloon highlights a theory of symbolism that takes the symbol as not contingently nor consensually produced, but rather manufactured by authority, and it is this theory that underlies the ninety-ninth chapter of *Moby-Dick*, "The Doubloon." After detailing the imagery stamped onto the coin, as well as its powerful influence on those who pass by it, Melville provides a series of "readings" of the doubloon from some of the novel's chief characters.

Ahab's reading comes first and each of the following may be thought of as reactions, or at least secondary interpretations, to what he puts forth, being, as he is, the primary defining voice of the doubloon's meaning. Ahab sees the coin as an egotistical reflection of himself: "The firm tower, that is Ahab; the volcano, that is Ahab; the courageous, the undaunted, and victorious fowl, that, too, is Ahab; all are Ahab" (332). Ahab does not "read" the coin as much as he "writes" it; that is, rather than draw significance from the images on the doubloon, Ahab imposes his ego onto it. He recognizes his role in the reading and produces meaning without mediation—the doubloon "mirrors back his own mysterious self" (332). Just as Ahab controls the fate of the Pequod, he too controls the symbol.

Each of the following interpretations similarly display the interpreter's world view: First mate Starbuck, the conservative Quaker, sees in the coin the world as a gloomy vale of death—the "great sun" hovering above the valley represents God's righteousness, which "still shines a beacon and a hope" (333). Stubb, the "[g]ood-humored, easy, and careless" second mate is earlier defined as a kind of deferential fatalist, who rarely thinks of death, but when he does, takes to it as one obeying an order (104-5). His reading of the coin confirms this worldview, as he sees nothing significant in it—"there is nothing wonderful in signs"—and submits them to an assumed hierarchy—"the fact is, you books must know your places" (333-4). He then supplies a jolly and fantastical astrological story that he amusingly relates to the figures on the coin. The next reading comes from the third mate Flask, who "see[s] nothing here, but a round thing made of gold" (334). Flask does not revere the symbol just as he does not revere the "many marvels" and "mystic ways" of whales—"in his poor opinion, the wondrous whale was but a species of magnified mouse" (105). He interprets the doubloon only in the context of commodity exchange, its "worth" of "sixteen dollars," or "nine hundred and sixty cigars" (334). Queequeg's, Fedallah's, and Pip's readings are all given through Stubb's narration, and similarly reflect their established worldviews: Queequeg, whose tattoos resemble the zodiac images on the coin, compares his ink with the doubloon and finds a correlation with one on his thigh, but gives no sign of further abstraction; and Fedallah, the mystical Persian fire worshipper, sees the sun on the coin and simply bows to it. Pip's reading is immediately taken as gibberish; he had recently gone mad after leaping from a harpoon boat and being stranded in the ocean. Facing the coin with his "unearthly idiot face," Pip repeats several times, "I look, you looks, he looks; we look, ye look, they look," then says, "And I, you, and he; and we, ye, and they, are all bats; and I'm a crow, especially when I stand a'top of this pine tree here. Caw! caw! caw! caw! caw! caw! Ain't I a crow?" (335).

While each reading reflects the individual character's way of interpreting or articulating the world—Starbuck's Quaker orthodoxy, Stubb's jolly carelessness, Flask's commonsense practicality, Pip's madness, etc.—this production of meaning, of asserting one's individuality onto the interpretation, is not made explicit; the readers of *Moby-Dick* have to draw the connections between the individual character type and their interpretation of the symbol. This suggests that, although individuals create meaning by applying to symbols a specific mode of interpretation, these crewmen are nonetheless unaware of their role in a symbol's creation. Each character interpreting the doubloon has only an *indirect* relationship with it; each reading is defined by an ideology, or at least a manner of reading undetermined by themselves, which serves as a mediation between the symbol and its perception.

Ahab, however, not only sees himself in the doubloon, but explicitly acknowledges how the meaning of the doubloon depends on his interpretation. The symbol *is* Ahab; he has a direct relationship with it, he is the one who pulled the coin out of a previously established symbolic order and redefined it as himself. This is what distinguishes Ahab's reading from the others. The other readings suggest submissions to figurative ideologies undetermined or uncreated by the reader himself, while Ahab, who has the authority to stabilize figuration, can legitimately say the coin and him are one. Starbuck can say the sun represents God, but not Starbuck; Stubb can see how the images resemble the zodiac, but depends on Bowditch's *Epitome* and his "almanack" to read them rather than himself (333), and Flask refers to a system of commodity exchange.

Thus, for Melville, authority and hierarchy have everything to do with symbolism.[221] The doubloon chapter demonstrates how a single symbol generates

[221] The order of the readings follows suit with this insight in that they are arranged by descending levels of authority: Captain, First Mate, Second Mate, Third Mate, Other Crewmen, and concluding with Pip, the lowly cabin boy/jester.

multiple readings, and how this results not in consensual or mutual definition of the symbol, but of a power struggle where one reading ultimately eclipses the rest (Ahab's "awe-striking end"), stabilizing signification by endorsing an assumed relationship of contingency between signifier and signified. Though we might think along Emersonian lines that symbols are natural and contingent correspondences between things and ideas representing a common referent, in fact people in power, and not an Over-Soul, determine meaning. Melville's theory of symbolism is thus one that attributes the status of the symbol to structures of power that charge it with meaning in order to stabilize, and hierarchically organize, competing modes of interpretation and, consequently, to reproduce that organization. Ahab's claim to defining the meaning of the doubloon is as valid as anyone else's, but because he has the power to nail the coin to the mast, to direct the ship and to stabilize signification, he simultaneously maintains and reproduces his authority. This point is further confirmed by the "winner" of the doubloon—Ahab. He puts the coin up for grabs only to grab it himself.

The doubloon in *Moby-Dick* is a more poetic way of expressing the same thought Melville earlier described in *White-Jacket*, that language is a controlled system that stabilizes prejudiced hierarchies of meaning and sustains structures of power, maintaining the stations to which particular people are assigned. Consider, for example, chapter seventy-two of *White-Jacket*, where Melville details the hypocrisy enacted by captains of man-of-war ships when enforcing the Articles of War, what he later defines as a morally bankrupt "arbitrary code" (303). Melville extracts Article XV, a rule governing the use of language on board a man-of-war to demonstrate the power of language to maintain levels of authority:

> According to Article XV., "*No person in the Navy shall quarrel with any other person in the Navy, nor use provoking or reproachful words, gestures, or menaces, on pain of such punishment as a court-martial shall adjudge*."
>
> "*Provoking or reproachful words!*" Officers of the Navy, answer me! Have you not, many of you, a thousand times violated this law, and addressed to men, whose tongues were tied by this very Article, language which no landsmen would ever hearken to without flying at the throat of his insulter? (300)

Not only written laws like Article XV, but also those unwritten laws that invest "the Captain with so much judicial and administrative authority over" the common sailor are, as Melville puts it, "destitute of individual guarantees to the mass of seamen as the Statute Book of the despotic Empire of Russia" (301). Article XV makes explicit the connection Melville draws between the use of language and the perpetuation of authority. Those who have direct access to the rules of language, those who get to define which words are reproachful, simply put, those who write the laws, reproduce the structures of power and consequently the prejudices these structures assume. The first mention of the Articles of War in *White-Jacket* appears in chapter eleven, "The Pursuit of Poetry," and similarly links written language with the perpetuation of authority: when the lieutenants in the Ward-room received word that the journal of Lemsford, a poet and member of the After-guard who planned on publishing his journal under the title "*The Cruise of the Neversink, or a Paixhan Shot into Naval Abuses*," contained "reflections somewhat derogatory to the dignity of the officers," they employed a "certain clause in the Articles of War" to justify seizing it, driving a large nail through its two covers (thus rendering it "everlastingly sealed") and tossing it overboard (43). This episode suggests how writing may be considered a threat disrupting Naval authority, and how further writing, the Articles of War, may be employed to suppress the threat.

The prejudice upheld by the symbolic order expressed in the Articles of War not only controls class distinctions between officers and sailors, maintaining those assigned stations, but also infiltrates relations among all men, especially by sustaining illusionary racial divides, to which Melville regularly calls attention. When discussing how all sailors, regardless of race, run the risk of the scourge, White-Jacket insists, "we snatch at a chance to deceive ourselves into a fancied superiority to others, whom we suppose lower in the scale than ourselves" (277). Race as any indicator of superiority is an illusion. It is merely a visible marker, a "pasteboard mask," moulded by the ungraspable reasoning thing behind all appearances and employed by those manipulating the symbolic order and determining the use of language. Melville repeats this insight when concluding his chapter on the power of language embodied by the Articles of War:

> Nor, as has been elsewhere hinted, is the general ignorance or depravity of any race of men to be alleged as an apology for tyranny over them. On the contrary, it can not admit of a reasonable doubt, in any unbiased mind conversant with the interior life of a man-of-war, that most of the sailor iniquities practiced therein are

> indirectly to be ascribed to the morally debasing effects of the unjust, despotic, and degrading laws under which the man-of-war's-man lives. (304)

Melville not only describes race as an illusion, but further points out how this illusion is fostered by the "arbitrary code," and employed, like the code itself, to justify tyranny. Inequality is wrapped up with modes of expression and *White-Jacket* displays Melville's attempt to reason through the linguistic structures that advocate despotic conventions.

The difference I am here drawing between *White-Jacket* and *Moby-Dick* speaks to the scholarly appropriations of the novels as endorsing, respectively, Enlightenment and Post-Enlightenment techniques. Simply put, *White-Jacket*, as an "Enlightenment novel," appeals to reason in order to combat the unsound grounds of prejudice nascent to arbitrary codes fostered by those authoritatively controlling the use of language. That is, here Melville explicitly addresses the connections between language, power structures, and racial prejudice to make a case defending his "desire to see wrong things righted, and equal justice administered to all" (304). The appeal to reason is less pronounced in *Moby-Dick*, as rational argumentation is no guarantee of positive change, and, just as the readers of the doubloon fail to recognize their role in the interpretation of symbols, those oppressed by the system are denied access to the symbolic order to make their case justifiable. If *White-Jacket* displays the connection between language and authority, then *Moby-Dick* can be thought of as the next step, where Melville applies his insight to disclose how symbolism and figurative language function under the same rubric of reproducing structures of authority. In contrast to *White-Jacket*, Melville appears more conscious of the figurative structures of language in both *Moby-Dick* and "Benito Cereno," more playful with narration, point-of-view, and symbolism, which consequently directs the reading of these later novels towards his position regarding figurative language as such, and, for my argument, the comparative status of the literal. Despite its justified allegations regarding the structures of authority defining the uses of language, *White-Jacket*, conditioned as it is by an early modern ethos of rationality, ends up maintaining a notion of the literal—of a one-to-one correspondence between signifier and signified—that consequently preserves the ordering of the symbolic that Melville challenges. *Moby-Dick* complicates this notion by demonstrating the multiple ways of interpreting symbols and re-enforcing the insight that authority deceptively stabilizes signification. However, it is “Benito Cereno” that marks a turning point in Melville’s appropriation of the literal from the confines of figurative power structures, which charge the literal with a specified meaning—that of one-to-one correspondence—to present it as the positive void of meaning that Ahab feared existed behind the “pasteboard masks” of all visible things. In “Benito Cereno,” the literal becomes nothing.

Padlock and Key

Returning to “Benito Cereno,” and my contention that even “conventional” symbols become unconventional in Melville’s writing, I will first look at how he employs the symbol of padlock and key. There are two primary instances in which this symbol appears: first, in the calculated encounter between Cereno and Atufal; and second, immediately following the deposition, when Melville writes, “If the Deposition have served as the key to fit into the lock of the complications that precede it, then, as a vault whose door has been flung back, the San Dominick’s hull lies open to-day” (100). In the second appearance, Melville employs the symbol to reference discernment, to say that by applying the knowledge gained by the truthful deposition, we may unlock the meaning of the fictitious story—that is, unlock the unassimilated referents of meaning fostered by the symbols composing the story. But this puts pressure on what appears to be the conventional meaning of the symbol itself in that it implies that we need one symbol—the lock and key after the deposition—to understand the first—the lock and key within the story.

The first instance is even more complex, in that it undoes its symbolic function as it employs it. Atufal, Babo’s commissary draped in chains “thrice wound round his body” with “terminating links padlocked together” (49), approaches Cereno in what Delano believes is a regular scene performing the captain’s mastery of his slave cargo. Babo then relates to Delano that Atufal had undermined the captain and, as punishment, must wear these locked chains until he asks Cereno’s pardon. His approach and refusal to ask Cereno’s forgiveness prompts the following scene:

> "What, pray, was Atufal's offense, Don Benito?" asked Captain Delano; "if it was not something very serious, take a fool's advice, and, in view of his general docility, as well as in some natural respect for his spirit, remit him his penalty."
>
> "No, no, master never will do that," here murmured the servant to himself, "proud Atufal must first ask master's pardon. The slave there carries the padlock, but master here carries the key."
>
> His attention thus directed, Captain Delano now noticed for the first time that, suspended by a slender silken cord, from Don Benito's neck hung a key. At once, from the servant's muttered syllables divining the key's purpose, he smiled and said:—"So, Don Benito—padlock and key—significant symbols, truly."
>
> Biting his lip, Don Benito faltered.
>
> Though the remark of Captain Delano, a man of such native simplicity as to be incapable of satire or irony, had been dropped in playful allusion to the Spaniard's singularly evidenced lordship over the black; yet the hypochondriac seemed in some way to have taken it as a malicious reflection upon his confessed inability thus far to break down, at least, on a verbal summons, the entrenched will of the slave. (51)

The symbol as understood by Delano, and at this point the reader, carries obvious meanings of lordship and mastery—the "Spaniard's singularly evidenced lordship over the black." But as we later find out, the lock does not function in the way it initially appears to, as a device restraining Atufal, upon which its symbolic associations depend. Rather, it performs the very opposite function, to allow Atufal the ability to roam the decks as an unacknowledged threat. The lock represents freedom rather than confinement. As a symbol—a thing seen standing for a thing unseen—the lock is not really a lock. But the lock is not really a lock anyway. If anything, the key around Benito's neck is, symbolically understood, the real lock, indicating Cereno's inability to free himself while under Babo's watchful eye. By using a conventional symbol under such unconventional circumstances, Melville displays how the status of figurative language may be manipulated to contradictory effects. If this point is not totally persuasive, coded as it is as symbol, Melville provides more obvious clues: first, in Delano's naïve commentary on the scene, practically begging the reader to acknowledge the exchange as symbolic, "significant symbols, truly;" and second, in the narrator's description of Delano as "a man of such native simplicity as to be incapable of satire or irony." By adding this descriptor of Delano in relation to the lock and key, the symbol becomes a placeholder not only for its more immediate associations—associations that are already complicated by the back and forth of an exchange recognizably symbolic—but for an entire discourse concerned with the function of figurative language itself. Delano is here defined by his access to and the limits restraining him from reading the exchange, where restraint becomes a highlighted element of the meaning of lock and key; he can recognize symbols, but not irony, for irony reveals ambiguity and the disruption of stabilized figurative hierarchies, where the meaning of a sentence contradicts its literal intention, thus indicating a breakdown of the agreements between referent and expression. In both instances of the lock and key symbol, the cohesive thread refers to their representing modes of discernment, first as blocking the reader's understanding, and second as throwing the vault door open. Symbolism becomes irony in that the meanings of the lock and key become reversed; the key becomes the lock and the lock becomes the key. The lock ironically represents freedom instead of confinement. Melville thus underscores the power of irony over symbol, where irony indicates the disruption and reversal of figurative hierarchies.

The images, symbols, and sequences invite speculation by means of their consistent recurrence and unsatisfied conclusions, asking the reader to navigate their shifting values and toying with the reader's tendency to categorize them into a reasonable pattern of meaning.[222] And because these symbols are so integral to the formal structure of the story, intimately associated with Delano's slow comprehension of the happenings aboard the San Dominick, they force the reader to re-interpret what at first glance seemed conventionally symbolic at each moment of his or her latest understanding of the story. Whether the figurative language under scrutiny consists of conventional symbols or those of Melville's unique creation, like the color symbolism which, when employed in the famous "Whiteness of the Whale" chapter of *Moby-Dick*, stresses such elaborate ambiguity as to make its expected meanings unstable, the critical conclusions are joined in their being unsatisfied. The impulse driving Melville's works that leads to such

[222] I should point out that viewing "Benito Cereno" as resistant to recognizable patterns of meaning was not always the established reading. Many critics have considered the foundation of the symbolism to depend on, as Cardwell puts it, the following formula: "Babo is pure evil; Don Benito is pure good; and Delano is the genial, insensitive observer" (71). But, as most studies since the Melville revival demonstrate, the novel is much too ambiguous, and Melville much too directed to an uncertain future, as to make this simple formula acceptable.

unstable conclusions is the recognition that figurative language can only be discerned by further figuration. What is often read as Melville's pessimism and awareness of evil—those qualifiers that many use to distinguish him from Emerson—are wrapped up in a complex relationship between the figurative with the literal, which comes to the fore in the juxtaposition of the fictitious story and the concluding deposition.

Robin Magowan argues that Melville's turn to Delano's original source was driven by his "becoming increasingly preoccupied with an emblematic way of writing—one that works through a set of fixed symbols" (348). This statement is somewhat vague when we consider how often Melville transmuted factual events into his fiction, but more importantly, it indicates an unacknowledged impulse towards textual stabilization and categorization that imagines a recognizable divide between Delano's work and Melville's, a divide that the story itself attempts to undo as it reveals such divisions as inherently hierarchical.[223] Much of the scholarship that deals with Melville's transmutation of fact into fiction seeks to locate where the author alters the source—name changes, character additions, etc.—thereby gaining a more comprehensive insight into his intended meanings concerning the story's strands of symbolism. These readings still maintain a kind of prejudice against Melville's work in that they privilege the source as a more truthful representation of real life events—the novel then becomes a derivation of truth, perhaps more artistic, but a derivation nonetheless. But anyone who reads the deposition, despite acknowledging its formal claims to objectivity and mimetic representation—both in conveying a true event and in translating Delano's original source—would undoubtedly recognize the artistic gestures laced throughout. The bracketed interjections of the narrator, the resurfacing of symbolic images like the lock and key, and the carrying over of conspiratorial figures, imply that although this is a legal document, it is still a story, which prompts the reader to question its emblematic status.[224] Is this fictionalized addendum of a realistic document less concrete than the document

[223] The only noticeable exception being *Pierre*. See Feltenstein 146.

[224] Melville also includes a few jokes. For example, he pokes fun at Delano's naiveté when describing how, under Babo's watchful eye, Cereno was unable to "tell a single word, or give him the least hint, that he might know the truth and state of things" (96). Delano receives plenty of hints that something is awry on board the *San Dominick*; he is simply too naïve to understand them.

which inspired it? Do they not function in the same manner, as written accounts representing an acknowledged event, written in the same formal language? Isn't a chief aspect of the story recognition that things aren't always what they appear to be? Where it at first appears that the inclusion of a document like this, which only seems to alter the form of the narrative immediately preceding it, functions as a method to verify an exterior reality thereby granting realist credence to the novel, its consistency with the narration, symbols, characters, and images we found meaningful in their metonymic shiftiness supports a different conclusion: namely that the same process of symbolic discernment is called for in both modes of expression.

The juxtaposition, then, of first a realist documentation of an original account, witnessed in the gesture of the concluding deposition, with, second, the shifting of conventional symbols that consistently reference the uncertain nature of symbolic exchange, allows for a complex ambiguity to arise. The first, coming later in the story, would suggest, on its own, that a stable relationship between an event and its telling exists, thus determining truthful conveyance. The second, upon which the deposition depends, suggests the opposite; that these signifiers are too fluid, too dependent on error that, when magnified, become unstable. The order of the two sections then suggests a process that reverses the established relationship between figuration and the literal; one must first navigate the shifty symbols, discerning the layers of symbolic figuration, prior to reaching the truthful and direct deposition with its assumed ossification of symbolic designations. "Benito Cereno" appears to perform the idea that Nietzsche would develop nearly twenty years later in his posthumously published essay "On Truth and Lying in a Non-Moral Sense." Namely, that truth presupposes fiction.

And yet the moral of Nietzsche's story, with its fairy tale opening and animal imagery, is that truth and lying are born simultaneously. If one reads "On Truth and Lying" as Nietzsche's bold endorsement of the positive qualities of deception, that is only because the concept of truth must first be dismantled and revealed as a system of knowing dependent upon originally false and, ultimately, prejudice hierarchies of meaning. Nietzsche's anti-truth statement is equally an anti-Plato statement, which makes it an anti-essentialist statement. Truth is a "mobile army of metaphors, metonymies, anthropomorphisms" (146) as much as figurative language is truth. They are knotted together. Nietzsche's question, simply put, is "perhaps the lie is as important as the truth," a thought that emerges when trying to make sense of the juxtaposition between the story of the San Dominick and the concluding judicial paper work. This is too the thought that underlies Melville's regularly unrecognized quip, "[a]fter the fictitious story, etc., the deposition proceeds" (95). Don't all depositions come after a fiction? And isn't this deposition, as an explicitly biased account from a single point of view—that of Cereno's authority—already a lie?

What needs to be accounted for, in respect to both the majority of critical studies of this novel as well as my reading of it, is the nascent tension that emerges when reading the story and the deposition as distinct and hierarchically organized—where the literal and discursive order (coded as "deposition") maintains authority over the figurative and artistic (coded as "story").[225] We do tend to treat the deposition as the "true story," thus ascribing to it fidelity of representation, where the designations between words and things, events and their telling, maintain a more direct correspondence. Yet the way Melville packages this direct correspondence within his fiction works to destabilize the

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[225] The following passages from Sarah Kofman's "The Melancholy of Art" define the tension that I think is revealed when setting the story next to the deposition. Here, Kofman analyzes the "gap between the figurative and the discursive order" that emerges when one approaches a work of art in a museum:

> The gap between the figurative and the discursive prevents one from stopping at any single, determinate meaning, as one might at an answer or last word to a riddle.
>
> The addition of a title to the outside of the painting, usually on the frame, is like a supplementary "caption" intended to force the painting to speak—a painting that, in and of itself, for structural reasons, can never be eloquent or escape its own muteness ….
>
> A resounding discourse of this kind, which in its clamor covers over the muteness of the work of art, is what most guides inflict on museum visitors, who are content to cast a vague glance, when they can, at the title and painting before moving on to the next. The same cover-up operation is performed by the catalogs in which the spectator takes refuge to read a description that is ostensibly objective and nonetheless laced with value judgments and projective interpretations that cut into [*entament*] the supposed purity of the "description." The implicit postulate of such descriptions is that of the perfect homogeneity between the figurative and the discursive order, a homogeneity that would make it possible to move from one to the other, from one sign system to another, while at the same time preserving an identical content, without remainder. Ultimately, it should be possible to reconstitute, even to generate, the painting on the basis of these discourses. (212-3)

My argument concerning the gap between the deposition in "Benito Cereno" (which likewise provides a "description that is ostensibly objective and nonetheless laced with value judgments and projective interpretations") and the story follows a similar logic. Melville's "Benito Cereno" brings this tension to the fore by asking us to read both orders as variants of the same *logos* that determines figurative and social hierarchies, that maintains structures of authority, and that privileges content to form.

confidence one has in "direct correspondence" between language and nature, as Emerson would have it. The way through this impasse is a reading of the novel that highlights the space between the two conveniently discerned "sections," as already performing figuration itself. The space here indicates the same blockage of communication, the same muted differential gap, between the literal and the figurative and the microworld with the semblant.

Much has been made about the problems of communication within Melville's works, and "Benito Cereno" is certainly no exception. Cesare Casarino argues that

> "Bartleby the Scrivener," "Benito Cereno," and *Billy Budd* … are texts that investigate blockages of communication, representational impasses, narrative conundrums. Ultimately, they are about the impossibility of telling a story, or at any rate the right story, the story that is able to speak the truth about itself, to reveal its own secrets. (55)

Expressive muteness is consistent. Atufal carries out his assigned duties without a sound, standing in "unquailing muteness," prompting Babo to mutter, "How like a mute Atufal moves" (49); Cereno is described as an "undemonstrative invalid gliding about, apathetic and mute"(42), with a voice "like that of one with lungs half gone, hoarsely suppressed, a husky whisper" (40); the Spanish sailor splicing cable, "became mute" as the surrounding negroes became talkative (60); and Cereno tells Delano that his losses from the gales, a lie to maintain the secret mutiny, were "[p]ast all speech" (68). Other descriptions of muteness and blockages of communication abound, such as the often quoted opening passage, where Melville writes, "[e]verything was mute and calm; everything gray" (35), and, as Delano prepares to leave, "all was eclipsed in sinister muteness and gloom" (82). Melville tells us that "[Delano] was about to speak in sympathy to the Negro, but with a timid reluctance he now re-entered the cuddy" (75), and how "Captain Delano had intended communicating to Don Benito the smaller details of the proposed services rendered … but [he was] unwilling anew to subject himself to rebuffs" (81). Cereno had grasped Delano's hand at this point, but, trembling, stood "too much agitated to speak" (81). There are constant whispers surrounding Delano's movements on the San Dominick, as well as unvoiced gestures and secret signs.

Melville most closely associates incommunicability with Babo. Early in the novel, the narrator describes how "like a shepherd's dog" Babo would occasionally "mutely turn [his face] up into the Spaniard's" (39), and gaze "with mute concern" (81); his hand is "mute as that on the wall" (78); he "bows his face" saying, "don't speak of me" (45); and, of course, in the novel's concluding passage, Babo meets a "voiceless end" (102).

The conclusion that Casarino draws from the blockages of communication to Melville's concern with the impossibility of telling a story is prominent in "Benito Cereno," and surfaces in the space between the story and the deposition, which, as hinted above, is too the space between the story and itself. But I would add that the story is not merely about the impossibility of telling, it is about re-telling as the only possibility, figuration built upon figuration. The deposition effectively doubles the telling of the story as the microscope doubles an object. The space between the deposition and the fictional story is like the space between two powers of magnification; they present us with two different views of the same object, and we cannot assume that one view is more certain than another. Thus what the microscope allows us to recognize, and what the blockages of communication performed in Melville's novels suggest, is that the continuity amongst modes of expression is constituted by breaks; both the story and the deposition share in the endless chain of signification composing the figurative order. If we think of the deposition not as a different story, or at least see in it as Melville does the falsity of privileging the discursive order over the symbolic rather than viewing them as the same, then we can read it as the same story told twice, just as we would understand multiple views of an object under the microscope as a series of unconnected views of the same.

While the deposition, in its pointing to an event that had occurred prior to and outside of the text, appears to suggest stable symbolic relations, it in fact has the opposite effect, because it demonstrates that this story is never directly told, but only re-told; its initial telling is already a re-telling, a representation of itself as a representation, self-referential language caught in an undisrupted figurative scheme that indicates an infinite regress or chain of signification. And just as the story cannot be told, it cannot be read, only re-read. If reading has anything to do with understanding, with making sense or discerning patterns of meaning, then "Benito Cereno," with its resistance to conventional symbolism and structure, demands re-reading.

Accepting the space between the deposition and the story as the space between the story and itself leads to an examination of the novel as one tied to the processes of reading, discernment, and of the space between the figurative and the literal. The deposition is not the key to unlocking the fiction because it is presented as already caught up in the figurative order, an order composed of breaks and blockages in communication. The only way to discern a story about discernment is by examining how the story represents the figurative order; a story about discernment is a story about the process of figuration that itself necessarily partakes in figuration. The symbol that best represents the integration of discernment with figuration is the Gordian knot. Here, we have the representation of how Melville understands figuration and the process of reading; his concern is not merely with what fits the figurative scheme, but with what does not, hence his complications of consistent patterns of meaning that result in unsatisfied conclusions. What doesn't fit is the literal, what is out of place is Babo, and what leads me to this conclusion is the Gordian knot.

The Gordian Knot

The Gordian knot suggests matters of extreme difficulty or indissoluble bonds consisting of twisted, intricate, and involved convolutions.[226] As such, it becomes a stand in for the narrative, representing the complexity leading to its appearance and providing the reader with something like a clue for how to read the story. The story is knotted up, and the reader's search for a loose-end, or a stable point on which to ground a fixed interpretation, inevitably leads to further interwoven complications, a consequence of the shifting symbolic patterns that alter with the reader's increasing understanding of the story and that consistently resist satisfied conclusions. This is why the Gordian knot makes sense here, for unlike other knots, this one cannot be unbound, only cut.[227] That is

[226] See "Gordian, adj. and n." *Oxford English Dictionary Online*.

[227] The legend of the Gordian knot is fairly well-known: in early spring of 333 B.C., during his campaign to overtake Asia, Alexander made a slight detour to visit the Phrygian capital of Gordium, drawn there by

to say, like the knot the story cannot be fully untangled or worked out to make clear the lines of connection between its signs and their significations. In this sense, we can view the Gordian knot as a kind of hermeneutic and ask how reading the story relates to the process of untying the knot. What does it mean to untie the Gordian knot and how does one untie the entanglements on board the San Dominick?

At this point, roughly half way through the narrative, Delano is well caught up in Babo's scheme. Prompted by one of the Spanish sailor's "imperfect gestures," an attempt to signal to Delano the ship's true state of affairs, the Yankee captain begins to reflect on Cereno's odd behavior. He first considers Cereno's withdrawal below deck as a pretense for maturing the plot of some evil design directed against his own men, but after a series of questions put to this "mad idea," Delano's racially charged ideology quells the inquiry:

> if the whites had dark secrets concerning Don Benito, could then Don Benito be any way in complicity with the blacks? But they were too stupid. Besides, who ever heard of a white so far a renegade as to apostatize from his very species almost, by leaguing in against it with negroes? These difficulties recalled former ones. Lost in their mazes, Captain Delano, who had now regained the deck, was uneasily advancing along it. (62-3)

Delano's questions fail to rupture the codes of meanings composing his Yankee ideology: blacks are too stupid to serve as reliable or functioning participants complicit in any complex secret strategy in league with Don Benito, and even if they were capable, a white would never abandoned his allegiance with his fellow species. Delano's descriptions of blacks on board are constantly laced with prescriptive judgments associated with this kind of thinking: when witnessing the "occasional cymballing of the hatchet-polishers," Delano sees "the whole file, like so many organ-grinders, still stupidly intent on their work, unmindful of everything beside" (47), and the Spanish sailor splicing cable mentioned above is flanked by two "sleepy-looking blacks performing the

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the famously unsolvable Knot. The Knot secured the oxcart that had carried the prophesized king Midas, founder of the Phrygian Dynasty, to the capital, and was so intricately wound that it had no discernible loose end by which to untie it. Whoever could unbind the Knot, as legend has it, would become the monarch of all of Asia. Alexander, being one who actively sought out such challenges, took on the task of untying the knot, which proved impossible for him to complete. However, Alexander was, in the words of his biographer John O'Brien, "incapable of shrugging his shoulders and walking away from an unsuccessful effort" (70), and in a moment of frustration, or perhaps clarity, he unsheathed his sword and quickly sliced the knot in two.

inferior function of holding the outer parts of the ropes for him" (59). These inherently prejudiced codes of meaning—the unambiguously racist images making explicit negro inferiority—that Delano employs when perceiving the atmosphere of the San Dominick have been established throughout the novel, and, it may be argued, even after the moment of revelation, his rationale regarding blacks as inferior remains unaltered.

However, Delano's racist reckoning of blacks as inferior is not always so straightforwardly given. Melville crafts a rhetoric of racism that displays racist attitudes as part and parcel to linguistic representation as much as to base intolerance of other races. Not only are Delano's racist opinions regarding the essential stupidity of blacks undone, but also undone are his idolizations, his delight in witnessing in blacks the "essential goodness" of humans in perfect harmony with nature. Melville recognizes that racism functions on more than one simplistic front because he sees racism not only as brutal acts of oppression, but tied into the figurative order as the substitution of an image for reality, and this other version of racism—the racism of extending an aesthetic adoration rather than political legitimization to oppressed peoples—is interwoven, or knotted, with Delano's more explicitly racist commentary. When describing how the hatchet-polishers would regularly clash their weapons together, for example, Delano applauds the "peculiar love in negroes of uniting industry with pastime" (39). As he observes a "slumbering negress" lying "like a doe in the shade of a woodland rock," with her "wide-awake fawn" "sprawling at her lapped breasts" (60), Delano thinks to himself, "[t]here's naked nature, now; pure tenderness and love" (61), signaling his tendency to make appearances fit his preexisting canons of meaning. Immediately following this scene, Delano turns his attention to "the other negresses," finding himself "gratified with their manners," in that, "like most uncivilized women, they seemed at once tender of heart and tough of constitution" (61). They are, accordingly, "[u]nsophisticated as leopardesses; loving as doves" (61). The narrator goes so far as to define Delano's apprehension of blacks as humorously benign: "At home, he had often taken rare satisfaction in sitting in his door, watching some free man of color at his work or play … In fact, like most men of a good, blithe heart, Captain Delano took to negroes … just as other men to Newfoundland dogs" (71). The connotations of Delano's assumption of the racial hierarchy are clear enough: blacks exhibit the good nature of man as loyal, dutiful, and respectful of superiority; dumb and unevolved, blacks, like children, ultimately benefit from their non-admittance into the political and social order, and may therefore, alongside being oppressed, may be also idealized and symbolized.

Through the racist rhetoric exhibited in Delano's judgments, a line drawn between literacy and the prejudice of Yankee ideology becomes manifest. Melville sees that while there is no natural ground for such a rhetoric reproducing racist stereotypes, the rhetoric nonetheless maintains an uneven and powerful system of prejudice, confirming as it justifies racially charged hierarchies. This is to say that the dominance of white Yankees like Delano depends on the manipulation of symbolic exchange, and recognition of this relation is the impulse behind Melville's complex and unique symbolism. Delano's racism, as displayed in the rhetorical substituting of an image for reality, does more than characterize him as the standard nineteenth century New England bigot, but further indicates the influence of patterns of meaning on his ideology. These racist images contradict reality at every turn, generating judgments that act like patches covering up their broken inconsistencies. And this is why the instances of these value judgments invariably follow moments when Delano feels agitated due to the specious atmosphere; they serve as a panacea sustaining his ideology while suppressing the disruptive forces competing with it.[228]

This is what we see when Delano, who cannot read the signs of danger nor irony in general, employs the seemingly non-malign racist images—the racially informed substitution of an image for reality in the form of idealization—as a cure-all in the face of those signs competing with it. Melville's symbolism, with its resistance to the stabilization that such rhetoric depends on, highlights as it performs the processes of figuration, enacted both in its consistent shiftiness and in its regular references to figuration as such. Because the novel is about reading and discerning the force of symbolic exchange, it tends to emphasize the figurative properties of the symbols it

[228] Race has been the chief concern for critical studies of "Benito Cereno" and I do not think it necessary to comprehensively detail the scholarship here. I rely on the standard reading of Delano as representing white Yankee racist attitudes.

presents, thus indicating their roles in the hierarchy of meaning. This too is why Delano can read symbols but not irony, as discussed above, for irony disturbs regular patterns of meaning while symbols reproduce them. All of this is to point out that “Benito Cereno” is about figuration as much as it is about race and insurrection, and to display why so many readings of the novel underscore its formal symbolic features and Melville’s attention to the operations of signification. Here too is why the story draws attention as one that “investigates blockages of communication, representational impasses, [and] narrative conundrums” (Casarino 55) and why it presents the reader with so many instances of expressive muteness. If the novel is about the inability to tell a story, or re-telling as its only possibility, then analyzing how it represents the orders of figuration and the operations of symbolic exchange become most significant. In this way, the Gordian knot takes precedence as a symbol representing the figurative order and the process of literacy.

The reader recognizes Delano’s practice of exerting his Yankee ideology as a palliative in connection with his inability to comprehend irony when Delano quiets his doubts while speculating on Don Benito’s intentions. Recalling former difficulties as he uneasily advances along the maze of the deck, Delano “observe[s] a new face; an aged sailor seated crosslegged near the main hatchway,” whose hands “were full of ropes, which he was working into a large knot” (63). Melville gives us the scene:

> Captain Delano crossed over to him, and stood in silence surveying the knot; his mind, by a not uncongenial transition, passing from its own entanglements to those of the hemp. For intricacy such a knot he had never seen in an American ship, or indeed any other. The old man looked like an Egyptian priest, making gordian knots for the temple of Ammon. The knot seemed a combination of double-bowline-knot, treble-crown-knot, back-handed-well-knot, knot-in-and-out-knot, and jamming-knot.
>
> At last, puzzled to comprehend the meaning of such a knot, Captain Delano addressed the knotter:–
>
> “What are you knotting there, my man?”
>
> “The knot,” was the brief reply, without looking up.
>
> “So it seems; but what is it for?”
>
> “For some one else to undo,” muttered back the old man, plying his fingers harder than ever, the knot being now nearly completed.
>
> While Captain Delano stood watching him, suddenly the old man threw the knot towards him, saying in broken English,—the first heard in the ship,—something to this effect—“Undo it, cut it, quick.” It was said lowly, but with such

> condensation of rapidity, that the long, slow words in Spanish, which had preceded and followed, almost operated as covers to the brief English between.
>
> For a moment, knot in hand, and knot in head, Captain Delano stood mute; while, without further heeding him, the old man was now intent upon other ropes. (63)

The knot serves no pragmatic purpose for the sailing of the San Dominick; it is introduced purely for its rhetorical significance. The only purpose it would have is as a diversion, as part of Babo's scheme, busy work for the sailors to keep up appearances, to keep Delano from discovering their real situation while allowing the "subordinate negroes" (64) to occupy all parts of the ship.[229] Melville makes explicit the suggestiveness of the knot by stating outright its connection with Delano's confusion; "knot in hand, and knot in head" and "his mind, by a not uncongenial transition, passing from its own entanglements to those of the hemp," demonstrate the representational character of the knot, standing in for the complex atmosphere of the ship and Delano's attempts to discern it. Paralleling Delano's inability to correctly read the lock and key symbols discussed above, he too cannot correctly read or "comprehend the meaning of such a knot." The knot itself is a product of some mysterious foreign logic unknown to Delano that has been interjected into his symbolic order, a point suggested first by his guess of its Egyptian origins and second by its association with language: the first English heard on the ship occurs here with the demand, "Undo it, cut it, quick." We find out that the story has been given to the reader in translation, suggesting a pervasive mediation between the events and their telling. And this demand in English, that momentarily disrupts the cover-up operation enacted through the Spanish language, returns us to the legend of the Gordian knot and Alexander's famous "solution," to violently cut it in two instead of unbinding it by means of its own composition. The knot and the demand to cut it silence Delano who is now, like those around him, described as "mute." What it takes to read this knot is a certain access to the symbolic order from which it originates, an order with which Delano cannot communicate.

Like so many of the other symbols in the novel, this one too carries a sense of literacy with its appearance. That is, the reader is made to recognize that she is reading a

[229] See Darryl Hattenhauer, "'Follow Your Leader': Knowing One's Place in 'Benito Cereno'."

symbol as she reads it, and in this way Melville continues to convey figures while indicating their status as figures. Here, he does this by linking the knot with Delano's mind and his search to discern meaning along with the interjection of the broken English, language as such posed alongside a particular symbol. By presenting the symbol as a representation of Delano's attempts to comprehend the meaning of figures, Melville suggests a parallel between the action of the story and the reader, who too attempts to discern the knot's symbolic function, thus highlighting the interrelated process of reading and comprehension. The knot then may be read as a symbol that represents the figurative order and the attempt to discern it, the knotting up of thing and sign, the links between representation and the thing represented, between signifier and signified. The symbolism here mirrors the structure of the novel as part fiction and part deposition, all wrapped up in the figurative order.[230]

If tying the knot indicates the process of figuration as it represents the story itself—that of Delano's wandering about the knotted and complex atmosphere of the San Dominick—then untying the knot would indicate the reversal of this process, something like a de-figuration, or the deciphering of coded meanings. Another way of saying this is that to untie the knot is to make it literal. By making literal, I mean the organizing of patterns of meaning to simplify and stabilize otherwise ambiguous points of contact between signifier and signified. In terms of literary critique, the untying of the knot mirrors the interpretive practice of discerning a story's representational figurations in order to articulate them in a literal mode. As Jonathan Culler puts it, "[r]eading is an attempt to understand writing by determining the referential and rhetorical modes of a text, translating the figural into the literal … and removing obstacles in the quest for a coherent result" (81). Melville is mindful of this practice in his project of undoing the knots of racist imagery—the agreements between images and reality—produced by a hierarchically mandated discourse, which he accomplishes by means of disrupting the

[230] Melville's knot is here reminiscent of Lacan's use of knot imagery, most readily recognized in the Borromean knot, which he employs as a topological figure demonstrating the interrelatedness of the symbolic, the imaginary, and the real. Lacan's Borromean knot is especially interesting in that if one link is cut, the entire system unravels, indicating a parallel with the Alexandrian Solution associated with the Gordian knot.

agreements of white symbolic exchange. The Gordian knot serves not only as a symbol of these agreements but also as an indicator of how they may be disrupted. Reading the knot as Melville's representation of the figurative and the process of its discernment leads us to question the place of the literal.

The Place of the Literal

The relationship between the literal and the figurative is generally defined in two ways. On the one hand, the literal is often considered a kind of ossified ground for figurative representation, indicating a one-to-one relationship between signifier and signified. The literal in this sense, as *sens proper*, where the properties of the referent are conveyed most cleanly, assumes a certain empirical and sensible truth that can be made to swerve by means of symbolic connotations. The literal meaning of a sentence is the meaning it has when in a "zero" or "null" context, as John Searle puts it, and must be sharply distinguished from the speaker's intention, for the speaker may mean something other than the sentence's literal meaning.[231] Figures of speech like metaphor indicate when a speaker means something different from the literal meaning; irony when the speaker means the opposite; ambiguity when two literal meanings are acceptable; nonsense when none are. In any case, the literal is thought of as a fixed ground on which the figurative sense of a sentence is built, the figurative meaning always a kind of derivation from its literal, "null context," meaning. The literal thus signifies the ground upon which figuration depends, as the "real" or "actual" event that pre-figures its conveyance in a system of symbolic exchange. Figuration then, as Bill Readings points out, becomes thought of as a secondary or mediating function, as "a detour within language, which departs from the literal in language in order to reveal what is most proper, most literal, in the proper" prior to its "transportation into the purely denotative, closed order of a literal language" (393).

On the other hand, the literal may be considered as always already caught up in figuration, as a particularly venerated metaphor that falsely determines symbolic

[231] See Searle, "Literal Meaning" 207-24.

exchange by its misleading placement outside of the closed order of language, and is thus prone to sustaining the dominant ideas of a ruling class. While the first notion of the literal assumes stable symbolic relations, this understanding points out the impossibility of escaping figuration. “The literal,” writes Readings, “in its most rigorous sense, is a metaphor, and in that branch of Western philosophy named positivism, it has become the metaphor of metaphors” (394). Readings continues,

> [t]he literal is thus a trope among tropes, which is not to erase literality but to insist that the literal be rhetorically rather than literally described: that is, that the literal cannot ground itself outside rhetoric, in a referential real abstracted from the figural. (394)

The literal, as that which “most properly respects the properties of things” (Readings 393), preserves meaning when denotative language is formally insufficient (meaning may be lost if detached and coded outside of the context or speaker’s intention) or insufficient in content (the code lacks the proper word). The argument then goes, as Readings summarizes, “[t]hus the literal governs the figural in that, even if language may be rhetorical, may turn away from the literal, meaning itself, prior to language, must always be literal. Prelinguistic meaning is governed, even before it comes to language, by a linguistic metaphor of literality” (393-4). This opposition between the literal and the figurative creates a binary scheme that twentieth century literary theory has called into question, most notably by those thinkers working out of the Nietzschean model as presented in “On Truth and Lying in a Non-Moral Sense,” where the literal signifies the exhaustive and complete description of an event without the carrying over of meaning nor the leaving out of elements of the original experience.[232] For Nietzsche, the literal is a

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[232] Lawrence Hinman, in his essay “Nietzsche, Metaphor, and Truth,” defines Nietzsche’s position when he writes,

> The literal—whether this be defined in terms of common sense, natural science, religion, or in some other way—is that point at which language and world are most intimately in contact with one another and least contaminated by anything which does not directly touch upon their shared boundary. (182-3)

For Nietzsche, one speaks “literally” only when a word is used without any “carrying over” of meaning, that is, when the word used directly designates an object through a one-to-one correspondence of word to object. Moreover, in Nietzsche’s account, a word also loses its purely literal character when it “leaves out” elements of the original experience. Thus, for Nietzsche, the paradigm case for the purely literal use of language would be, according to Hinman, one “in which a word expresses completely (i.e. without leaving out anything) the meaning of a given experience and which expresses only (i.e., without carrying over metaphor whose figurality has been forgotten.[233] Figurative language in this sense is no longer considered as a deviation from a literal and prelinguistic ground, but as the only possibility for communication, the simultaneous springing forth of truth and lie.

What many scholars of "Benito Cereno" rightly emphasize is Melville's awareness of the significance of figuration, detailing how his complex symbolism is offered in a self-referential and meta-figurative fashion highlighting their figurative status. That is, as I have tried to demonstrate in my reading of the Gordian knot and the lock and key, Melville not only gives us symbols, but does so in a way that underscores the symbolic order, and as such his works become capable forerunners to theories of the figurative outlined above. But even when attempting to elucidate Melville's concerns with the complex relationships he draws among figuration, literacy, and ideology, readings of "Benito Cereno" tend to neglect that interesting counterpart to the figurative which we call the literal. If Melville recognized how structures of power and modes of perception are intimately linked with the operations of signification, along with the dangers of disrupting and undoing these figurative hierarchies, then he would probably consider the functioning of the literal as well. The Gordian knot, as representative of the figurative, leads us to two questions: firstly, if the knot represents the figurative, then what represents the literal; and secondly, how does the literal relate to the symbol of the Gordian knot?

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anything) that experience" (183). If anything could meet the standards of the literal defined in this way, it would probably look something like a combination of a proper name and an exhaustive definite description. It is this notion of the literal that Nietzsche attacks. By making the standards of a purely literal use of language so strict, Nietzsche allows himself to posit the realm of the metaphorical as coming before the literal, as being somehow more fundamental to our use of language than both the purely literal meaning of a word and of what we consider the truth of states of affairs.

[233] See Jonathan Culler, *On Deconstruction: Theory and Criticism after Structuralism*, where he discusses Paul de Man's project to disclose how canonical thinkers composing the Western philosophical tradition (especially Locke, Condillac, and Kant) attempt to control metaphor but "cannot extract themselves from metaphor and that in each case a crucial distinction between the literal and the metaphorical breaks down." Culler writes, "The literal is the opposite of the figurative, but a literal expression is also a metaphor whose figurality has been forgotten. The philosophical is condemned to be literary in its dependence on figure even when it defines itself by its opposition to figure" (148).

Babo and the Literal; or, Suppressing the Mut(e)ineers

The space between the story and itself, the parameters of which are ambiguously defined by the conflict of narrative and deposition, with their mutually valid claims to the real, indicates the impossible task of escaping the figurative. And so locating the literal in "Benito Cereno" demands a different approach to literality, one that reads for, according to Jani Scandura, "a return to a moment that precedes one's interpellation into the symbolic order," to read for "what lacks a place, what is or has been radically refused" (24). Scandura suggests that what underlies such a reading for the literal is an "extra-experiential" drive to "look for ideas in things," a drive that is "fostered by a desire to glimpse at the shoreline of the prelinguistic imaginary and the symbolic, and of the symbolic and that which resists signification, the real" (25). The real as that which resists signification; is this not precisely what gives force to the "supplementary" deposition "following the narrative"?

The phrase "a cigar is just a cigar" is often used as a claim to the literal, as it exemplifies the forgetting of figuration in order to demonstrate an unqualified one-to-one relationship between signifier and signified that thus gives the literal its regulative and governing force. But what is this sentence? It is nothing other than a tautology, language repeating language. It means nothing; it is sheer surface. In this sense, "a cigar is just a cigar" actually does perform the literal, not because the literal imposes an assumed and standardized field of meaning, and not because the literal functions as a dead metaphor charged with forgotten meaning, but because the literal is non-meaningful. What the literal reveals is the lack of meaning, or the non-meaning that is suppressed by figuration.[234] This is why the literal resists signification, why it lacks a place, and why it must be refused. It is this notion of the literal—one that recognizes the literal as non-

[234] The emergence of the literal is not unlike the unveiling of the Nothing that Heidegger describes in "What is Metaphysics?". Through the fundamental mood of Anxiety, the "peculiar calm" of the uncanny feeling makes manifest the Nothing. As beings as a whole recede from us, we are faced with Anxiety, which "robs us of speech. Because beings as a whole slip away, so that precisely the nothing crowds around, all utterance of the 'is' falls silent in the face of the nothing" (89). The Nothing serves as Heidegger's prelinguistic imaginary, resisting signification, robbing us of words, and providing the irruption necessary for speech and the naming of things to exist. But where Heidegger views the unveiling of the Nothing as calm—unsettling, no doubt, but still calm—the emergence of the literal in "Benito Cereno" is emphatically not.

meaning itself, uncomfortably dwelling on the shoreline of the extra-experiential and prelinguistic imaginary, somewhere prior to the organization of symbolic canons and codes of meaning—that I think best coincides with Melville's presentation of it, and that allows us to better regard the slipperiness of his symbolism, the necessity of the Alexandrian solution, and Babo's place in the novel.

This notion of the literal is displayed by the microscope in that the microscope not only magnifies the objects on the slide, but also the space between levels of magnification. That is, the microscope not only magnifies the objects of its focus, but also the gap that structures perception itself, just as the positioning of the deposition and the fictional story makes apparent the space between rhetorical modes of writing as simultaneously different and unified, by bringing together competing views of the same object, a space that is emphasized in the regular rebuffs and blockages of communication. This spatial/organizational impasse disclosed by microscopical views is the same as that described above by Catherine Wilson:

> Greater magnification, a sharper image, more convenient microscopes … amount to more mystification. The microscopist who examines a plate with lenses of successively higher power sees new structures emerge and the earlier ones disappear from view. The suggestion that what appears with more magnification might explain what happens at a level closer to the surface is troublesome, for to get one level in view is to lose the other. So the microscope again seems to offer only a series of unconnected views. (231)

That which blocks our views of the same object is not a "thing" at all, but a space, a nothing that nonetheless shapes our perception, a gap that is located not within the object, but on its very surface. By magnifying the surface of a singular object, the microscope ends up producing an infinite number of both representations and perspectives, disclosing not the origin, but the constitution of the reality of the object as dependent upon perception in construing it, and the role of the literal, as empty space, in organizing, that is "connecting," the "series of unconnected views." The literal is the term that names this empty space between two views of the same object, the space that is left out of view while it conditions its appearance, and that disrupts as it shapes perception of a single object. The literal is the image of the prelinguistic, and locating it in "Benito Cereno" means locating that which resists signification, lacks a place, organizes perception, and is ultimately refused.

Our first clue of how the novel represents the prelinguistic literal is suggested by the instances of expressive muteness presented above. The tension felt throughout the novel, which grows as Delano comes closer and closer to discerning the true state of affairs onboard, coincides with the breaking down of the figurative veils enacted by the revolutionaries. Expression without speech becomes increasingly significant as it indicates that which cannot be said as that which determines what can be. These instances of expressive muteness display the breaking of the surface of figuration, the moments where the chain of signification is weakened. What goes unsaid—voiced by lungs half gone, bitten lips, and regular rebuffs—points to that which is suppressed or held at bay by the figurative, and serves as a cohesive thread whose power of cohesion is nothing but the disruption of the organized figuration that operates as covers to it. Babo, more than anyone else on the San Dominick, is associated with expressive muteness, embodying voicelessness with his muted hands, his unspoken directives, and his ultimate decapitation. It is he who blocks communication, directing the rules of symbolic exchange, and as the chief embodiment of muteness comes to represent the literal as the disruption of, not the ground of, figurative hierarchies. Expressive muteness links Babo with the literal, drawing attention to him as its clearest representation.

Of the three primary players, only Babo can be said to be lacking a place. Stolen from his home and now captaining his former prison, Babo and crew sail aimlessly (we are told that his aim to sail to Senegal is impossible "on account of the great distance, the necessity involved of rounding Cape Horn, the bad condition of the vessel, the want of provisions, sails, and water" (91), the verity of which depends on Cereno's account given in the deposition, which could be, after all, a lie to trick Babo). In any case, whether referring to Babo's place prior to his enslavement or during his time aboard the San Dominick, it is clear that he is not where he should be. The lack of place connected with Babo is further suggested by one of the earliest symbolic gestures, the fact that "the stranger, viewed through the glass, showed no colors" (35). Paralleling the ambiguity of Melville's color symbolism, "show[ing] no colors" indicates the lack of a national flag, which might otherwise connect the ship with a recognizable place. The story itself takes place near "a small, desert, uninhabited island," a spot defined by its "lawlessness and loneliness" (34-5). The narrator consistently notes how like a "stranger" the San Dominick is, not only to Delano, but to the place where they meet: "the ship, in navigating into the harbor, was drawing too near the land; a sunken reef making out off her bow. This seemed to prove her a stranger, indeed, not only to the sealer, but the island" (35). The setting and the opening descriptions of Babo's ship thus define it as one lacking from place, as a "stranger," a term used almost exclusively to refer to one who belongs to another country, a foreigner.[235]

Likewise, Babo, along with his crew, has been radically refused. This almost goes without saying that as a slave, Babo has been stripped of and refused freedom and humanity. But he has also been refused access to the symbolic order, unable to set the conditions for self-nominalization and definition. His attempt to determine these conditions, which consequently characterizes his power and genius, displays an illusionary submission to the figurative hierarchy. Babo understands that he must maintain the hierarchy if he is to ensure his escape, but this proves impossible. His lack of place was itself borne out of his being radically refused; he was made into a commodity and injected into a symbolic order that defines his role as slave, a role he was able to disrupt through the violent revolt. Throughout the novel, Babo's status, along with his place, rests uneasily between freedom and enslavement; neither term can define him, nor can any other. It is the ambiguity of Babo's place and status that gives force to his statement, "don't speak of me; Babo is nothing" (45).

The name, Babo, with its stark contrast from the other main players, Amasa Delano and Benito Cereno, suggests further connection of Babo with the literal. The name itself has drawn a fair amount of attention, particularly during the Melville revival in the early twentieth century and continuing throughout the increasing interest in his works. Harold Scudder, for example, claimed that Melville intended "a sinister suggestiveness" (531) with Babo's name, and Stanley Williams argued that the name

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[235] See "stranger, n. (and adj.)" *Oxford English Dictionary Online*.

further suggested Babo as “a mutinous baboon” (73). Robert Cochran, who has collected a few of the more salient interpretations comprising the controversy, writes,

> Disagreement [with Scudder and Williams] came in 1950, when Joseph Schiffman denied the probability of symbolic meaning in the name, adding that Melville “found the name in Delano's Journals, the source of his ‘Benito Cereno.’” In 1961, Allen Guttmann attacked Schiffman’s suggestion as a “lame” answer, claimed that Melville “selected the name ‘Babo’ from a long list of names in the source,” and went on to argue that Melville “wanted the primitivistic associations” and intended to praise them. (217)

Later readings include those by David Galloway, who offers the significant similarity between Babo and Bab-ed-Din, a Persian religious fanatic who had brought about an insurrection similar to the one aboard the San Dominick; Kingsley Widmer, who sees Babo as “a variant of the derisive ‘babu,’ originally a Hindu form of polite address adapted as a generic term for ‘native’ by Anglo-American sailors” (227); and Peter Hays, who suggests that Melville “picked Babo as chief of the rebels because the name, description, and character all coincided so closely with those of Bembo, the Maori harpooneer in Omoo” (45).[236]

Putting the previous controversy over Babo’s name aside, I would like to offer a somewhat more speculative reading for the name, one less limited by ensuring Melville’s explicit intentions, which remain unknown, and that recognizes a nascent homophonic etymology pertaining to the discussion of the prelinguistic imaginary and the analysis of the space between the story and the deposition. Considering first the names of the “captains,” we notice a stark contrast between Amasa Delano and Benito Cereno with Babo. On the one hand, Amasa, homonym of “massa” or “master,” and Benito Cereno, comprised of “bene,” good or well and “serene,” or tranquil, indicate a powerful and peaceful hierarchy, an undisturbed mastery, connected with four dactylic names, each

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[236] See Robert Cochran, “Babo’s Name in ‘Benito Cereno’: An Unnecessary Controversy?;” David D. Galloway, “Herman Melville's ‘Benito Cereno’: An Anatomy;” Kingsley Widmer, “The Perplexity of Melville: ‘Benito Cereno’;” and Peter Hays, “Slavery and ‘Benito Cereno’: An Aristotelian View.”

Cochran’s conclusion, as the title of his short essay suggests, is that Melville’s placing of Babo at the head of the rebellion is so grounded in Delano’s source material as to make speculation on the name a matter of little consequence. Considering how my reading complicates the distinctions between the novel and the source material, and consequently those arguments that depend on a strict relationship between the story and the deposition, I find Cochran’s verdict insufficient. As Ernest Hemingway once said, “All good books have one thing in common—they are truer than if they had really happened.”

consisting of three ordered and poetically lilting syllables. The nascent order here observed is further confirmed by the names' first letters: A,B,C, and D, which reminds us of the motto painted on the side of the *San Dominick*, "Follow your Leader."

On the other hand there is Babo, a spondee consisting of two repeating syllables. The homophonic etymology here centers on a term that the Yankee captain would immediately associate with Babo, a term corresponding with his unacknowledged racist idealization of blacks, namely, *barbarian*.[237] *Barbarous* comes into English from the Latin *barbar-us* and Greek *βάρβαρος*, preceded in use by the simple *barbar*. The Greek word, according to its etymology given by the *Oxford English Dictionary*, "had probably a primary reference to speech, and is compared with Latin *balbus* stammering" ("barbarous, adj."). The original meaning of *barbarian* was not entirely pejorative, its sense darkened after the Persian wars, when Romans took up the word and applied it to foreign tribes and nations, hence the later senses of "outlandish, rude, brutal, uncivilized" associated with *barbarian* stem from "non-Hellenic, foreign, not Greek nor Latin," and eventually "not Christian." The word is born out of incommunicability. Joseph Shipley, in his *The Origins of English Words: A Discursive Dictionary of Indo-European Roots*, cites the Greek *barbaros* as the predecessor to *baba*, baby talk, stammering, defining the Greek term as "making unintelligible sounds" (22). Walter W. Skeat agrees, adding "the name was applied by Greeks to foreigners to express the strange sound of their language" (47). *Barbar*, with its onomatopoeic repetition, was meant to signify the unintelligible grunts of what the Greeks viewed as an essentially prelinguistic and illiterate people, "barbars" or "the Unintelligibles, the Stammerers" (Partridge 39). In this sense, *barbar* might be considered as an indicator of "pure" language or the "prelinguistic," that is to say, as "the literal," in the sense of giving voice to the non-meaningful, and Babo, following the same formulation as *barbar*, spondaic onomatopoeic repetition, and falling into the same coded camp of the non-European, non-Christian other, may then easily be linked with the etymology of *barbarian*. "Babo" clearly follows a different linguistic

[237] One entry for "barbarian" given by the *Oxford English Dictionary Online* shows how the term is "sometimes distinguished from *savage*," citing a sentence from D. Wilson's *The Archaeology and Prehistoric Annals of Scotland*: "Still a barbarian, but had ceased to be a savage." See "barbarian, n. and adj." *Oxford English Dictionary Online*.

pattern than both “Amasa Delano” and “Benito Cereno.” The name suggests the self-referential nature of language, born out of the non-meaning chaotic babbling on the surface of language: Ba-bo is tautology.

Further intensified, then, is the ambiguity of Melville’s novel, for Babo appears to suggest the literal as the meaningless babbling of tautology while presenting him as the chief spokesman of figuration; it is, of course, Babo who manipulates the figurative in order to deceive Delano. But, as discussed above, Babo’s ability to employ the figurative comes from an illusionary submission to it, marking him as both the mutest and the most articulate. The literal cannot be spoken, yet it determines what can be as it opposes the figuration that depends on it. This surfacing of the literal becomes apparent in both tautology and irony. When the literal emerges, the figurative is cut. Isn’t this precisely the forcefulness behind irony? The recognition that one expects the figurative, but is given the literal? What “Benito Cereno” tells us about the nature of the literal is that its emergence is always a violent disruption of fixed meaning. Contrary to what previous theories of the literal might assert, the literal does not function to calm anxiety, nor does it slow down the slipperiness of language so that it may be rationally manipulated and categorized.[238] When the literal is considered not as the location of fixed, stable meaning, but rather as non-meaning, then the prejudice between it and the figurative is reversed. Thus, when one submits to fixed meaning, one submits to something other than the literal, namely, the figurative. The literal, as the space between figuration, the non-meaning that lies at the core of meaning, the space that blocks as it allows two views of the same object, disrupts fixed, stabilized, and hierarchical meanings.[239] This is why Delano is “incapable of satire or irony” (51), his “undistrustful good nature” (35) keeps him from seeing the violence that exists at the core of figurative hierarchies of meaning that he has submitted to, what Melville would probably liken to the all pervading evil of

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[238] In opposition to Heidegger’s speculation on the arrival of the Nothing, terror, not placidity, accompanies the appearance of the literal.

[239] This is why when one reads “literally” or to the letter, one reads for what lacks a place, for the reader must leave the symbolic order that effectively mandates and organizes—fixes and stabilizes—meaning itself.

the social world as evinced here and in works like "Billy Budd."[240] The untying of the knot does not represent submission to the literal, then, but to the figurative, because in order to untie it one must assume the hierarchy of meanings (the A,B,C,D) that led to its intricacy. Delano misinterprets Babo precisely because he cannot read literally; he can only read according to the figurative canons and codes of meaning sustained by his Yankee ideology, and Babo's recognition of this pervading and unacknowledged submission to the figurative order is what allows him to so persuasively enact his scheme.

The Alexandrian solution—the notion that is referenced but ultimately missing from the Gordian knot scene in the knotter's demand to "cut it, quick"—consequently gains greater significance. While violence is clearly present in the novel—its climax is portrayed by Babo's attempt to cut Delano's throat, resulting in an intense battle and the tearing away of the veils of misdirection—the actual cutting of the knot does not occur. Instead the knot is tossed overboard, representing the suppression of the literal's emergence. Melville's project, to undo the knots of white discourse, is carried out by dislocating racist images from their use as substitutes for reality and by disrupting the agreements of racially charged symbolic exchange. But what disrupts these agreements in its fullest way, in a way that cuts through the operations of signification, is the literal. That is, when it comes to the impossible problem of undoing the sign relations composing white discourse, the literal is the Alexandrian solution. The Gordian knot, then, represents a moment where the chain of signifiers could have been stopped and the hierarchical codes of figurative meaning disrupted. If the knot had been cut by means of the Alexandrian solution, or the employment of a foreign logic untenable in the terms in

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[240] Take for example the following passages from "Billy Budd, Sailor" where Melville's pessimism regarding the social world is unquestionably stressed:

> Life is not a game with the sailor, demanding the long head—no intricate game of chess where few moves are made in straightforwardness and ends are attained by indirection, an oblique, tedious, barren game hardly worth the poor candle burnt out in playing it. … Every sailor, too, is accustomed to obey orders without debating them; his life afloat is externally ruled for him; he is not brought into that promiscuous commerce with mankind where unobstructed free agency on equal terms—equal superficially, at least—soon teaches one that unless upon occasion he exercise a distrust keen in proportion to the fairness of the appearance, some foul turn may be served him. A ruled undemonstrative distrustfulness is so habitual, not with businessmen so much as with men who know their kind in less shallow relations than business, namely, certain men of the world, that they come at last to employ it all but unconsciously; and some of them would very likely feel real surprise at being charged with it as one of their general characteristics. (136)

which the knot was initially tied—tied, we remember, by a “cross-legged” Spanish sailor—then the figurative order would have been halted.[241] But it was not cut. The ultimate act of refusal in the novel, then, is the suppression of the literal; the tossing of the knot overboard signifies the refusal of allowing the Alexandrian solution, the cutting of the figurative order, to emerge. This act does more than simply foreshadow the suppression of the mutineers, but indicates the origins of all such suppressions. Babo is once again silenced; the disruption is recognized but quieted, the signifying chain remains undisrupted, leading to the story’s ambivalent, skeptical, and pessimistic conclusion.

“… since I cannot do deeds, I will not speak words.”

What does it mean that the knot remains intact? Melville, who is rarely if ever optimistic, recognizes that the severing of the knot and the inherent violence this entails is too demanding a task for a culture of Bartlebys and Delanos to undertake. “Benito Cereno” finds its place in a line of Melville’s novels including *Moby-Dick*, “Billy Budd,” and “Bartleby” where the notions of a nation at sea and of social oppression are highlighted while the ideological order maintains its grip on an established hierarchy of social stabilization by means of a collective submission to the figurative.

This is to say that the novel itself does not provide us with a clear or defined ethical code nor a strategy for political melioration; it resists such categorical normative claims much like the symbolism resists stricture to a definitive pattern of meaning. An indicator of Melville’s hesitancy to dictate any such moral directives is the uncanny calm that pervades the story prior to the climax, the calm that he attaches with the figurative which becomes uneasy when the literal pressures the cover up operation, the kind of calm

[241] The idea of the Alexandrian solution as the employment of a foreign logic is built into the definition of the Gordian knot. Included in the O.E.D.’s entry for “Gordian knot” is the phrase “to cut a Gordian knot,” which is defined as “to get rid of a difficulty by force or by evading the supposed conditions of solution.” While we might think of Alexander’s solution to be the last-ditch effort of a frustrated king attempted to avoid public humiliation by cheating, we can also recognize in the event the irruption of an exterior mode of thinking, one that cannot be articulated by those conditioned by the figurative order in which they partake because these conditions that the order supposes are evaded. See “Gordian, adj. and n.” *Oxford English Dictionary Online*.

associated with Delano's panacea of Yankee confidence. This calm I am here considering is one that contrasts with the type of sentimental excitement, the "ostentatious parading of excessive and spurious emotion" (14), that James Baldwin associates with Harriet Beecher Stowe's *Uncle Tom's Cabin* in his essay "Everybody's Protest Novel." In contrast with Stowe, Melville is not sentimental and this is not a protest novel, at least not an *Uncle Tom's Cabin* kind of protest novel. And yet, it is obviously politically charged, with a clear sense of protest; after all, the plot does follow an ill-fated attempt to cover up a slave revolt. So, how might we defend Melville's reluctance to promote a stronger polemic while keeping him from the damnation Baldwin bestows on Uncle Tom? The solution again comes from a reconsideration of the literal.

Baldwin's argument in "Everybody's Protest Novel" is that Stowe employs a dangerous formula whereby "black equates with evil and white with grace" (17). By dismissing the black body and by evading its ambiguous complexity, Stowe ends up confirming categorical values that reduces democratic freedom in its attempt to "robe [blacks] in white, the garments of salvation" (18). According to Baldwin, Stowe's novel, driven by a dishonest and cruel sentimentality, illustrates the desire to purify blacks of sins, consequently representing them as ill-formed variants of whites. Another way of expressing Stowe's attempt to ascribe to blacks the same values and religious zeal maintained by their white counterparts is to say that Stowe effectively injects blacks into a canonical and hierarchical figurative order, where blackness itself is refused and the "web of ambiguity, paradox, hunger, danger, [and] darkness" (15), the origins of the novelist's revelatory power and freedom, is dismantled by its being categorically organized.

Stowe's novel forgets what Baldwin asks us to remember: "that the oppressed and the oppressor are bound together within the same society; they accept the same criteria, they share the same beliefs, they both alike depend on the same reality" (21). Melville's reluctance to determine a course of action parallels his reluctance to re-inscribe Babo into an oppressive figurative order: he leaves the literal as sheer non-meaning, as the prelinguistic imaginary. And so what makes this novel so terrifying is not simply the violence that takes place between oppressor and oppressed, nor its only recognizable solution, the Alexandrian, but that Babo, as the radically refused, reminds us that our figurative categorizations are tied as tightly as the Gordian knot as they powerfully reject the disruptive emergence of the literal. The rejection of the literal is too the terrifying failure of the protest novel, as Baldwin elegantly writes, "The failure of the protest novel lies in its rejection of life, the human being, the denial of his beauty, dread, power, in its insistence that it is his categorizations alone which is real and which cannot be transcended" (23). Transcending the categorizations is the same as welcoming the literal, and "Benito Cereno" marks Melville's talent to think through the consequences of such a terrifying thought.

The emphasis on particularity, the disruption of figurative hierarchies of meaning and macroscopical placidity, the inherent blockages of communication, and the pronouncement of surface—these ideas help formulate the microscope's epistemology and emerge in "Benito Cereno." The microscope not only magnifies the objects beneath its lens, but also the muted gaps and empty voids that structure perception and signification. It revives our notion of the literal as it disturbs our confidence in a categorical objective world. Early modern microscopists thought that the instrument "would take us down to the realm of philosophical essences," but later discovered that "this realm of essences would turn out, at bottom, not to be a new world, but a familiar one" (Wilson 218). Aided by Melville's presentation of the literal, we can now more confidently say that the microscope does not reveal essence to us, but perhaps the unlocatability, or the non-existence of, essences. The microscope only reveals surface, introducing us to novel visions and representations of surfaces. This is what is familiar about the microworld: that it appears as phenomenally as do bodies in the visible world. The insight is one Melville would subscribe to and that distinguishes him from the abstract and transcendentalist leanings of his contemporaries.

Chapter 4.

“Things overlooked before”: Dickinson’s Disruptive Details

The last Night that She lived
It was a Common Night
Except the Dying – this to Us
Made Nature different

We noticed smallest things –
Things overlooked before
By this great light upon our Minds
Italicized – as ’twere. …

~ Emily Dickinson, *1100*

Details Matter

Emily Dickinson has been widely recognized for her breaking of conventions. As Cristanne Miller summarizes in *Emily Dickinson: A Poet’s Grammar*, Dickinson’s “peculiar brevity, lack of normal punctuation, [and] irregular manipulation of grammar, syntax, and word combination” (2) are just a few qualities that separate her poetic style from that of her contemporaries, and through which her poetry “rivals twentieth-century poetry in its disruption of expected patterns of style and meaning” (44). Even when Dickinson uses the “traditional unifying features of poetry” conventionally, e.g. rhyme, meter, stanzas, thematic and figurative repetitions, etc., the “underlying regularity” tends to make the surprise of her “disruptive punctuation, inverted and elliptical syntax … off-rhyme, and general ungrammaticality” that much more startling (Miller 44). Turn of the century reviews of her work, as Richard Sewall describes, criticized her irregularities as “barbarisms,” and condemned her poems for their “faulty rhymes, skewed syntax, and bumpy rhythms” (“The Continuing Presence of Emily Dickinson” 5). Some poems appear to have multiple speakers, none of which are clearly signaled to the reader; others break rules of capitalization; many apply unqualified apostrophes that alter the reader’s sense of the speaker’s sincerity; many more contain ambiguities of punctuation, where lines end with multiple and varying marks. Dickinson is known for poetic innovations like complex, and oftentimes frustrating, omissions of words, her disjunction and compression, and her remarkable precision. And, of course, *the dashes*—Dickinson's calling card and perhaps the greatest source of scholarly conflict concerning editing and printing, media and meaning. Simply put, Dickinson's poetry has long been considered irregular and rule-breaking.

Related to the poems' characteristic irregularity is the issue of reproduction and publication. Few other poets are so easily identified by their chirography as is Dickinson, whose collections nearly always contain an editorial preface describing the difficulty of transference from holographic manuscript to printed typeface, along with an image or two of her original handwritten works. Because of the ambiguous and unconventional markings, the variant lines and stanzas (sometimes marked with a "+" sign, sometimes not), the cancellations and additions of alternate words, and the multiple variations of the same seemingly unfinished poem, Dickinson's earliest editors had to make choices when compiling readers' editions; after the choice was made, and the poem effectively "finished,' alternate versions were rarely mentioned.[242] "Not surprisingly," argues Martha Nell Smith, "how poems are conventionally typeset has framed perceptions of her lyrics and thus dictated conceptions of accurate representations of Dickinson's poems, of what does and does not count as a constitutive part of the poem" (116). In other words, Dickinson's editors followed "routine procedures," debated which variant is the preferable one, determined the version that most faithfully represented what they thought was the poet's original intention, and then shaped the "best" or "most authoritative variant" (Smith 116), that is, the most completed poem, to fit the standards of print.

Since the surfacing of the variant manuscripts, scholars have debated the legitimacy of these editorial decisions. Despite publishers' best efforts, one might argue, to translate a handwritten Dickinson poem to the print medium is to reshape (or misshape) it into an image sustained by generic and technical standards, organizational strategies, and punctuation techniques that are necessarily at odds with the original form. A perfectly fair reproduction is usually considered impossible, an unsolvable attempt to

[242] See Smith, 113-118.

"tame work that otherwise … seems wildly unmanageable so that it conforms to conventional publishing standards" (Smith 118). This is not to say that the attempt to set Dickinson's poems in print is a fruitless endeavor, but rather that the process raises interesting problems concerning how we read, understand, and evaluate a poem's pieces. In every effort to "fix Dickinson's writings for books," Smith argues, the following questions are posed:

> What counts as a poem? What counts as a letter? What counts as a Dickinson poem? What counts as a Dickinson letter? What counts as writing by Emily Dickinson? What counts as a poetic mark? What counts as an accidental? What elements of marks are poetic? What characteristics are habitual and accidental, or meaningless for critical inquiry? (118)

The many issues that come along with the printing of Dickinson's poems—why one editor decided to end a line with an em dash while another decided to end the line with a period, or whether a poem should retain an original mis-capitalization or if the possible error should be proofread out, or to substitute a comma for a semicolon, or to insert an omitted word, etc.—have clearly received much scholarly attention. Whether or not to count a smudge as part of the poem, whether or not to include the dashes, or to "fix" the punctuation, these are questions that, as the mass of criticism no doubt suggests, have great import for how readers interpret any individual Dickinson poem. A fundamental premise of any such debate, and the source of scholarly conflict concerning the editing of Dickinson's poems, is simply this: *the details matter*.

Dickinson's poetry was doubtlessly interested in details, in the minute, in brevity and compression, in the everyday, and in immediacy of feeling. Her poetry attends to the small, the momentary, the *heimlich*. And so for both the editorial reproductions and Dickinson's original compositions, the detail becomes an important issue. In terms of content, the detail is often a point of attention and speculation for Dickinson, and in terms of form, the detail is linked with her poems' disruptive irregularities, their interruption of standardized language patterns, grammatical conventions, and rules of punctuation. To say that a poem's details determine one's interpretation of it is to say that the detail is not neutral, that the detail might enact some sort of agency, or might project politically-charged associations, might object to the norm.

A relevant study on the non-neutrality of the detail, on the detail as politically determined, organized, and stratified, is Naomi Schor's *Reading in Detail: Aesthetics and the Feminine*. In this work, Schor discerns a set of unequal valuations concerning terms of size (big, large, great, small, little, trivial, etc.) that feeds what she argues is a long-established network of hierarchical binaries that ultimately sustain a traditional hostility leveled at both the feminine and the detail (as its gendered aesthetic corollary). Schor contends that, on the one hand, terms signifying smallness have been linked to concepts of particularity, associated with the visible and material world, and gendered feminine, while on the other hand terms signifying largeness have been linked to concepts of generality, associated with the invisible and Ideal realm of Forms, and gendered masculine. In neo-classical aesthetic theory, Schor continues, due to the gendering of each set of associations—where "big" equals "good" and "masculine," and "small" equals "bad" and "feminine"—a sexist privileging of masculine artistic and metaphysical values over the feminine became a norm. This norm is then displayed in the confrontation of ornamental and sublime art in which characteristics representative of physical matter (e.g. sensuality, technique, complexity, color, ornament, etc.) are considered eye-catching exercises in extreme visuality, and are determined as inferior to those representative of Idealist artistic ambition (e.g. rationality, meaning, simplicity, line, balance, severity).

Beginning with Sir Joshua Reynolds's *Discourses on Art*, Schor argues for a representational presence of an underlying "anti-detailism" (4-5) grounded on two premises: first, that the detail is incompatible with the Ideal; and second, that the detail subverts the sublime. According to Schor, the notion that the detail is incompatible with the Ideal is a consequence of its "material contingency." She points out that for Reynolds, the painter, if he is to create a truly beautiful work of art, must "acquire a just idea of beautiful forms" in order to present nature *without blemish* (qtd in Schor 8-9). In Schor's reading, Reynolds's neo-classical aesthetics are grounded on Platonic principles: like the philosopher who aims at "the real"—that is at "absolute good, and absolute beauty" (73d)—the painter must "reach beyond" the material, must "abstract the Ideal from brute

Nature" (9).[243] The value of a work of art is determined by the artist's ability to transcend the material and realize the Ideal, a process that entails the conflation of any distracting details; details, Schor argues, serve as reminders of materiality and particularity, and thus disturb the work's harmonizing order.

Schor finds in the underlying logic of material contingency, modeled after Plato and used to justify the privileging of Ideal to particular, the source of the detail's non-neutral gendering. Though he never makes the connection between particularity and the feminine explicit, Schor argues that Reynolds's aesthetic theory "implicitly reinscribes the sexual stereotypes of Western philosophy which has, since its origins, mapped gender onto the form-matter paradigm" (9), where links between man-form-reason-order and woman-matter-nature-disorder are constructed and used to further validate the oppositional conceptions of general and particular. "Woman," so defined as an aberration of the Form of "Man," parallels the detail as an aberration of the Form of the artwork. According to Schor, the gendered formula further operates by setting the detail against the sublime. She argues that, for neo-classical authors like Reynolds and John Baillie, uniformity and grandeur are the "essential attribute[s] of the sublime object" (12). The sublime can only be experienced when the mind reaches beyond itself into contemplation of infinity, which requires a solid, expansive, homogeneous and uniform pattern. That is to say that the sublime object must contain no asperities that could otherwise arrest the mind's attention towards infinity; the surface of the sublime object cannot be broken up

[243] Plato generally considered the visible/material world as a kind of prison for the soul: the body corrupts the soul, demands of it, as Socrates tells Cebes in the *Phaedo*, to "deal with things that are ever changing" (79c), rather than to realize its purpose of contemplating the unchanging reality of the Forms. When arguing for the soul's immortality, Socrates defines the soul as naturally indissoluble and perfect, but as "no doubt permeated by the physical," and that this "constant intercourse and association with the body" necessarily "pollutes" it, makes it "impure," and "drag[s] [it] back to the visible region." A soul that has become too entwined with the body through a life directed only towards that "which one can touch and *see* or eat and drink" (81b-e) will be, after death, reborn into a corporeal substance representative of its previous bodily life. "It is for this reason," Socrates continues, "that those who practise philosophy in the right way keep away from all bodily passions, master them and do not surrender themselves to them" (82c). For Plato, the philosopher must "master" the bodily passions to best rid the soul of material impurities, a logic Schor sees preserved in Reynolds's aesthetics when the "manly artist of forms" is given the power to "correct nature," effectively inscribing the pedagogical role of the male to instruct female nature, to augment her brute passivity with reason, to perfect her "natural imperfections" (Schor 10). Remembering Emerson's explicit Platonic sympathies, we might read this association between metaphysics and the masculine as also preserved in the nineteenth century: in "Nature," Emerson derides empirical scientists, physiologists, and naturalists for bereaving students of the "manly contemplation of the whole" (*W* 1:66-7).

by innumerable parts, and thus the accumulation of details can never produce the sublime experience.[244] The detail, by arresting the mind's attention through visible eye-catching irregularities of surface, consequently subverts the sublime.

Finally, Schor argues that as the detail counter-produces the sublime, it at once produces, "by its very anarchic proliferation" (14) another style of "decorative" art that is also gendered feminine: the ornamental. The paradigm that aligns women with the material-visible world had, in Schor's account, further defined women as predisposed to their immediate surroundings, while men "prefer what is most distant … the general and abstract" (11). As such the woman artist "naturally" produces inferior works of art limited to mimesis, decoration, and ornament; incapable of realizing Idealistic content, she merely reproduces that which can be *seen*, "proof" of which is displayed in the embellishments characteristic of ornamental art, where details are piled on top of more details. While sublime works of art privilege order and harmony (traits Schor thinks neo-classical theorists associated with the rational powers of the mind), ornamental works present the disorder and chaos thought to define nature in its brute, mindless state. Works of art that showcase technique over meaning, complexity over simplicity, or excess over balance—works that promote the detailed ornamental over the Idealist sublime—are then demoted, considered inferior to the sublime style.

Details and Matter

Schor's argument that the form-matter paradigm preserves a traditional hierarchy where spirit trumps materiality appears roughly the same way in both Sarah Kofman's and Susan Sontag's criticisms of programmatic models of interpretation. Interpretation, they might argue, tends to be nothing more than the application of a prefigured theoretical schema dependent on metaphysical conceptions of truth, *logos*, and meaning that have always privileged unseeable spirit to seeable body, Ideal to material, and thus, if one accepts Schor's archaeology, masculine to feminine. For both Sontag and Kofman,

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[244] Schor clarifies that Reynolds's and Baillie's theories differ from that of Edmund Burke, who argued that smoothness of surface, not rugged irregularities, counteracts the sublime. See especially 12-13.

the materiality of the artwork (in contrast to its organizing concept, or "content") operates in a way similar to the detail in Schor's archaeology.[245] Consider, for example, Kofman's essay "The Melancholy of Art," where she discusses how features of the artwork that indicate its materiality present a resistance to figurative hierarchies. Taking Hegel's system as exemplary, Kofman describes how in this model, where works of art are arranged from "least to most spiritual," architecture serves as the bottom rung of the ladder precisely because of its overwhelming dependency on raw, visible material (its content is too entwined with its form); poetry sits at the top because it has ostensibly rid itself of sensible, bodily substance, becoming "only a sign of content, of representation, of spiritual interiority" (206).[246] The problem, as Kofman points out, is that art tends to resist both these hierarchical schemas and the logocentric-patriarchal notion of "interpretation" precisely because artworks always sustain nonsublatable material remainders, the sensible form towards which, Schor argues, the detail turns our attention. What this hierarchy indicates to Kofman is philosophy's attempt to master art, to "subordinate [it] to the logos and to truth" (205). Thus, where Schor sees the Ideal upheld by conflation of distracting details, Kofman sees it upheld by the conflation of material particulars.

Kofman comes to her notion of the "nonsublatable remainder" by questioning philosophy's "occultation" of art, its move to "make us forget art … to ensure its controlled sublation in the interest of reason and truth" (207). It is this remainder that disrupts the figurative hierarchies and upsets the opposition between the worlds of matter and Ideal that are reproduced by models of interpretation. Like Kofman, Sontag is

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[245] Sontag and Kofman approach the paradigm by means of a slightly but significantly altered terminology, one that works out of a Hegelian rather than Platonic tradition, and that recasts "form" (previously *eidos*) as signifying the artwork's materiality, its outward appearance or "stuff" that the organizing concept shapes, and replaces "matter" with the complex notion of "content." The change presents two ideas relevant to my study. Firstly, the diverse usage of terms suggests the fluidity of signifying systems in which a signifier can easily come to signify its opposite: "form" can and has been used both to describe the Ideal concept imperfectly embodied by an object *and* what may be considered at odds with this definition, the material substance of an abstract concept. Secondly, these theorists share the position that such paradigms assume a hierarchy that, in both cases (form/matter and form/content), privilege the immaterial to the material.

[246] At a higher level even then poetry is, of course, philosophy, which is chiefly concerned with logos and truth, that is, with pure spirit divorced from material remainders.

skeptical of programmatic readings of art, in which she groups Freudianism and Marxism, that make works of art "speak," that is, that make them part and parcel to the overarching logocentric hierarchy of philosophical discourse, to "restate the phenomenon … to find an equivalent for it" (7). Also, like Kofman, she finds in the application of interpretation an aggressive attempt to "make art manageable, conformable," to make art "into an article for use, for arrangement into a mental scheme of categories" (10). In other words, the application of interpretive schemes, with their axiomatic and principled rational categories, follows suit with what Schor discerns to be a conventional separation of mind and nature, invisible and visible, represented in the work of art and challenged by the detail.

An appeal to the material thus grounds both Kofman's and Sontag's criticism of categorical interpretations of art; the material element of the artwork is that which resists sublation and upsets interpretations that determine the work as an inferior copy of an abstracted organizing metaphysical rationale. The material remainder thereby "threatens" interpretative schemes that attempt to "make art manageable," and it does so in a way that I think correlates with Schor's archaeology of the detail:

> The irreconcilability of details and the sublime and the concomitant affinity of details for the effete and effeminate ornamental style point to what is perhaps most threatening about the detail: its tendency to subvert an internal hierarchic ordering of the work of art which clearly subordinates the periphery to the center, the accessory to the principle, the foreground to the background. (15)

What the detail does to interpretation for Schor is what the material form of artworks does to interpretation for Kofman and Sontag, and what I argue the microscopical particular does to metaphysical schemata as developed throughout the history of Western philosophy: it *disrupts*, and makes untenable categorical and essentialist manners of explaining phenomenal appearances of the material world.

Dissection and the De-tail

The detail and the microscopical particular are related as they share this disruptive quality, a notion observed in the etymology of *detail*: worked from the French verb *détailler*, "to detail" is to "cut in pieces." A possible source of the detail's disruptive quality then aligns with Peirce's conception of the "Hellenic repugnance to dissection" that he argues is preserved in Hegelian Idealism, and that I find in the etymology of *entomology*. Like the microscope, dissection characterizes the operations of the detail as it similarly disrupts by cutting up the whole, the organization, the *telos*, and the Ideal of the artwork. Both the detail and the microscopical particular, in their common connection to dissection, reveal a conventional prejudice against the kind of inductive thinking that inverts traditional metaphysical hierarchies in which the particular, the small, and the individual are sacrificed to maintain conceptions of the whole, the big, and the general. By localizing and extracting the particular, the microscope generates a mode of viewing that dismisses the whole and promotes the detail to be necessarily anti-Idealist. As the detail disrupts aesthetic schemata, the microscopical particular disrupts metaphysical, religious, scientific, and linguistic schemata; as the detail subverts the "organizing principle" of a work of art, the microscope disrupts biological classification systems by revealing things as habitats for micro-organisms. The detail subverts the sublime as, for Emerson, the microscope subverts the sublime, by interrupting the integration of particulars, by "interfer[ing] with the just perspective, the seeing of the whole" (*W* 4:287-8).[247]

Moreover, details, when considered aberrations from the Ideal, are viewed as imperfections, impurities, "blemishes to be expunged" (Schor 31). To align this thinking with the opening discussion regarding Dickinson and her editors, the details might be smudges to be erased, dashes to be omitted, punctuation marks to be "fixed" in order to print the "best" version, the most authoritative resemblance to the author's original

[247] As my reading of Melville argues, the microscopical particular and the detail likewise share in the disruption of canons of meaning organized by figures of authority. Also, by displaying the illusion of uniformity, the microscope disrupted Aristotelian concepts of homogenous substance as well as the form-matter paradigm as reinscribed onto early modern theories of procreation.

intention, the "Ideal poem." The details are problems. So too has the microscopical particular been understood, as a pollutant of generalized metaphysical laws, as destabilizing the world by revealing the uneasy balance between the visible and the invisible, chaotic microcosmos. Both the detail and the microscopical particular have been commonly associated with notions of imperfection, impurity, aberration, and error, and have, as so defined, been commonly devalued in the fields of aesthetics, science, and philosophy.[248] By displaying the illusion of uniformity, the microscope disrupted Aristotelian concepts of homogenous substance while unsettling the form-matter paradigm as reinscribed onto early modern theories of procreation. On the related discourse of language, the microscopical particular and the detail share in the disruption of canons and codes of meaning organized by figures of authority and of Emersonian symbolism, where particulars are conflated to realize the Over-Soul and where details are blurred, overlooked, or dismissed to better endorse the correspondence to the Ideal. The microscope discloses innumerable representations of objects through innumerable levels of magnification, and thus emphasizes an endless chain of perspectives that resists and undoes completion as the detail disturbs the teleology of the artwork.[249]

The "threat of the detail" then complements the "threat of the particular," which, as an agent of disruption, likewise unsettles sexist, racist, and authoritarian categorical schemas that determine prejudiced worldviews. The detail disrupts and the particular

[248] For Emerson, to use a microscope is to hunt down imperfections, which amounts to a failure to grasp the "truth" of the all-encompassing nature he calls the Over-Soul. The microscope, complicit with an ideology of partiality, names an imperfect manner of engaging with this Nature. Emerson's conclusion resembles those observations made by early modern microscopists who, when seeking the uniform alphabet of orderly forms lying beneath perception, faced instead a Baroque, disorientating chaos, wherein imperfections, not laws, appear to drive the semblant world. Peirce agrees with Emerson that to use the microscope is to hunt down imperfections and errors, but contrastingly argues that this process is precisely the value of microscopical scrutiny. According to Peirce, the evolution of the universe, like the evolution of instinctual reason, depends on the making of errors; the only reason we think otherwise is because we fail to see how mistakes beget truth. Thinking of minute particulars, or details, as pollutants, Peirce would argue, "result[s] from a false way of looking at things absolutely" (1.354), a way of looking that venerates laws as more universal than they actually are, that neglects to correct contradictions through clarification of particulars, a habit he associates with the bad logic of Hegelianism.

[249] As pointed out above, Melville's configuration of microscopical ideas (and the ambiguity of his details) leads to an explosive theory of the literal as the empty space of non-meaning towards which, in place of abstract Ideals, the details necessarily point. Melville's ambiguous symbols, with their consistent resistance to satisfied conclusions, are products of ambiguous supporting details, and in this way, Melville's details similarly subvert authoritarian constructions of figurative meaning.

disrupts; the concepts appear synonymous. If one accepts the detail as fundamentally disruptive as I argue the microscopical particular has been traditionally understood, then one might read Dickinson's poems—with the attention they so often give to the small, with their unique details, and the editorial controversy over the relative inclusion or omission of them—as likewise subversive. In her essay "How 'Low Feet' Stagger: Disruptions of Language in Dickinson's Poetry," Cristanne Miller argues:

> Emily Dickinson sees and understands her world through her manipulation of words. According to her logic, if one is to be anything more than a passive observer of the world, one must exercise some essential control over those words, and for Dickinson this control often takes the form of linguistic violation … To participate in the control of social or personal relationships, a nineteenth-century woman had to disrupt, to some extent, existing (male) authority structures … Dickinson manifests her (female) poetic freedom in undermining traditional patterns of language. (134)

The power, control, and freedom expressed by Dickinson's poetry, according to Miller, is generated by the disruption of masculine patterns of language, and this subversion of the masculine, I think, may be linked with the power, or the "threats," of the detail and the particular. Considering her equally strong interest in science, Dickinson's subversive poetry, with its link to the minute, further contributes to my study of the microscope as it considers the confrontations between scientific optics and spiritual seeing while managing to strike a balance between the pressures of the big with the powers of the small.

"What triple Lenses burn upon": Dickinson and Optics

The education Dickinson received as a youth was as unconventional as her poetry (unconventional, that is, for a young woman living in nineteenth century United States), and had led to an equally uncommon interest in advanced science. Her schooling has been well documented by scholars interested in her family's history and connections with Amherst public life. Her grandfather, Samuel Fowler Dickinson, along with a few other prosperous men of Amherst, founded Amherst Academy in 1814, which later became Amherst College, and which, according to Sewall, would become a "nursery of

Dickinson's" (*The Life of Emily Dickinson* 45). Despite the college's religious foundations, its curriculum, according to Cynthia Griffin Wolff, offered a "range of secular learning [that] was comprehensive by any standard" (17).[250] When in 1840 the nine-year-old Emily Dickinson entered Amherst Academy, Edward Hitchcock, a distinguished botanist and geologist, had been teaching a number of well attended courses there for some fifteen years, and had, Sewall describes, "established the reputation of the college as a leader in the natural sciences on a par with Yale and Harvard" ("Science and the Poet" 15).[251] Under Hitchcock's pervasive influence (he was installed as President of the College in 1845), Dickinson undertook a varied curriculum that went "well beyond the reading, writing, and arithmetic" often associated with those "supposedly unenlightened days" (Sewall 348). Though there is no way of knowing exactly which classes she took, scholars have determined that she would have read scientific textbooks and attended numerous lectures on science-related topics. In a letter to Jane Humphrey, she describes her botany and geology courses with great enthusiasm [3]; in a letter to Abiah Root, she expresses her interest in both "'Silliman's Chemistry' & Cutler's Physiology" [20]; and in a letter to Austin, she says she has been "all engrossed in the history of Sulphuric Acid!!!!!" [22]. In addition to botany and geology, Dickinson likely took courses in mental philosophy, algebra, and the "brand new" science of electricity; she would later expand her studies to include chemistry, physiology, astronomy, and natural philosophy (Erickson 46).

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[250] Provisions for education in Amherst were low at the turn of the century when Dickinson and others founded Amherst Academy, an undertaking that nearly lead to his bankruptcy. "[S]urprisingly enough," writes Cynthia Wolff, the college founders "also wanted their daughters taught the more advanced branches of education so that they could be good Christians and mothers" (17), thus opening a door to Emily. The Dickinson family would always maintain strong ties to the institution and its later developments: Emily's father Edward Dickinson attended the Academy before entering Yale in 1823, only to return and serve as the College treasurer in 1835, a post he would hold for thirty-seven years; her brother Austin entered in 1846, completed the four year curriculum, and graduated Phi Beta Kappa in 1850—following his father, Austin would also return to hold an extended tenure as the college treasurer; Emily's younger sister Lavinia would enter the Academy alongside Emily in 1840; and her nephew Edward (Ned) Dickinson eventually took a position as an assistant in the College's library. See Sewall 10, 45, 52, and 98.

[251] Also in 1840, Hitchcock had founded the American Association of Geologists, and served as its first president; eight years later, the group was expanded to include physics, and was renamed the American Association for the Advancement of Science (Dimock 617).

After Amherst, Dickinson studied at Mount Holyoke Female Seminary, founded ten years earlier through the tireless efforts of Mary Lyon. Lyon was a protégée of Hitchcock's (she too had attended Amherst Academy) and a scientist in her own right (a chemist by training) who established a curriculum rich in both secular scientific and religious course offerings.[252] Though there were aspects of Mount Holyoke that Dickinson liked very much, like "the institution's unwavering dedication to a serious education for women" (Wolff 100), she spent only ten months (or two terms) in residence. One reason often given for her short residence is that, though Holyoke's curriculum stressed empirical science and laboratory experience, the presence of religious structures was nonetheless overwhelming.[253] Scholars have established Dickinson's feelings of religious oppression at the Seminary, her fear of being "easily excited" and ultimately "deceived" by Amherst revival meetings, and her stubborn resistance to giving in to religious pressure. Mary Lyon, for instance, would call meetings of suspected "unbelievers," or "impenitents," to probe them with questions concerning religious fidelity. After one of these meetings, Dickinson wrote to Abiah Root, "[t]here is a great deal of religious interest here and many are flocking to the ark of safety. I have not yet given up to the claims of Christ" [20]. Wolff argues that, while Dickinson was not unique in her hesitations towards the religious agenda at Mount Holyoke—other students felt the same—and while she never made "any vociferous issue of her resistance," she also never yielded to "the unrelenting exhortations to relinquish reason for faith" (101). Submitting reason for faith was something Dickinson refused to do, but her resistance does not necessarily define her as unreligious. After telling Root that she has "not yet given up to the claims of Christ," she quickly follows that statement with, "trust I am not entirely thoughtless on so important & serious a subject" [20]. The troubled relationship between

[252] See Wolff 99-101, Erickson 46, and Sewall "Science and the Poet: Emily Dickinson's Herbarium and 'The Clue Divine'" 15.

[253] Her reasons for leaving have been a source of scholarly interest: Sewall argues that she may have found the curriculum repetitious and that "Amherst Academy gave her all the formal education she needed or wanted" (361). He also points out that the "Academy and the college, not to mention her library at home," had offered "richer opportunities than Mount Holyoke at that time possibly could have" (361). Others have highlighted her now famous struggle with homesickness, her physical illness (two severe attacks of flu), and social attitudes concerning women's education beyond primary school (as the curators of the *Emily Dickinson Museum* state, "[l]ess than twenty percent of the students during Dickinson's year returned to the seminary for additional study" (6)).

science and matters of faith would surface in Dickinson's poetry long after her formal education had ceased.

Fred D. White, in his essay "'Sweet Skepticism of the Heart': Science in the Poetry of Emily Dickinson," asks readers to consider the "widespread scientific and technological developments that were taking place during Dickinson's childhood and adolescence" (121), and in this way we might think of the Academy as an institutional representation of a scientifically-minded *Zeitgeist* more broadly understood. For White, these "technological developments" define the cultural climate of mid-century Amherst, and help explain Dickinson's interest in the sciences. He cites Joseph Henry's discovery of electromagnetic induction and electromotive force, Samuel Guthrie's discovery of chloroform, Samuel Morse's invention of the telegraph, Henry Fox Talbot's and Louis Daguerre's invention of photography, Crawford Long's use of ether in surgery, the legalization of dissection in Massachusetts, the discovery of Neptune, and the establishment of the American Association for the Advancement of Science as only a few notable developments defining the 1830s and 1840s (121). Marianne Erickson reminds us that 1830, the year of Dickinson's birth, "coincides with the year in which American inventor Robert L. Stevens invented the modern railroad," an invention that "would significantly change the American landscape of the nineteenth century" (45), and one that Emily's father Edward passionately endeavored to bring to Amherst (Sewall 52). Many Dickinson scholars have pointed to the "scientific atmosphere" of nineteenth century New England as an inescapable force of influence on her poetry, which was likewise experimental and motivated by innovation.

"Few poets in the twentieth century, let alone the nineteenth," White continues, "have incorporated scientific concepts into their work as purposively and effectively as Emily Dickinson" (121). Erickson agrees, arguing that "close readings of Dickinson poems and letters, considered along with what we know of her education, suggest that Dickinson was not only aware of, but positively influenced by nineteenth-century progress in science and technology" (45). The poet's "amazingly comprehensive scientific and technical vocabulary" (White 121) has been a chief source of curiosity as scholars seek out her awareness of topics like astronomy, biology, botany, chemistry, geology, medicine, optics, physiology, psychology, technology, and more.[254] Comparing Dickinson's words with those of Ralph Waldo Emerson, John Keats, and Sidney Lanier, William Howard locates in her large vocabulary "2,333 words used by the Amherst poet that are not found in the concordances of the other three" (229). Of these 2,333 words, 770 of them might be considered "unusual" for coming from "special sources," the largest grouping of which are "technical terms of one sort or another or words generally found only in scientific or academic discourse" (230). White counts just over two hundred poems that "touch on scientific themes" (121), while Nina Baym, in her study *American Women of Letters and the Nineteenth-Century Sciences*, counts "more than 270" (133).[255]

Working through these "science poems," which constitute roughly fifteen percent of the total, Baym demonstrates Dickinson's broad knowledge of technical language and their associated concepts.[256] Those that deal with astronomy often provide the names of stars, constellations, or planets (e.g. Arcturus, Orion, Mercury and Saturn), making use of terms like *eclipse*, *parallax*, and *perihelion* (134). Several other poems reference electricity, where *circuits*, *lightning*, and *sparks* often lead to reflection on unseen forces of life. Poem 440, for instance, suggests that the "Curl" of a Clematis is activated by electricity ('Tis various – as the various taste – / Clematis – journeying far – / Presents me with a single Curl / Of her Electric Hair); poem 1129 likens the telling of truth to a flash of lightning, both of which are "Too bright" for the frail human condition, and must "dazzle gradually." Others, such as 1392, 1431 (which also references ornithology),

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[254] In addition to Sewall, Erickson, White, and others cited above, all of whom discuss the relationship between Dickinson's poetry and science, see also: Nina Baym *American Women of Letters and the Nineteenth-Century Sciences*; Hiroko Uno, "Chemical Conviction": Dickinson, Hitchcock and the Poetry of Science," "Optical Instruments and 'Compound Vision' in Emily Dickinson's Poetry," and *Emily Dickinson's Marble Disc*; Robin Peel, *Emily Dickinson and the Hill of Science*; Daniel J. Orsini, "Emily Dickinson and the Romantic Use of Science;" Christine Avery, "Science, Technology, and Emily Dickinson;" and Aoi Yamada, *On the "Hill of Science": A Contemporary Study of Emily Dickinson's Poetry and Mount Holyoke Textbooks*, among others.

[255] To give a sense of the kinds of terms scholars like Howard might view as "scientific," Byam provides a partial list that includes: *amplitude, axiom, axis, concave, condense, corrode, entomology, equilibrium, experiment, hypothesis, ignition, momentum, ornithology, parallax, perihelion, perpendiculars, phosphor, prism, pyrite, species, terrestrial, valves,* and *velocity*" (134).

[256] All poem numbers refer to those in *The Complete Poems of Emily Dickinson* edited by Thomas H. Johnson.

1585, and 1597 (where she describes the “fervor” of the “steadfast Heart” as an “electric Oar”) propose the idea that, as Baym describes, “the heart is motivated by electric impulses” (134), an idea that combines both electromagnetism and physiology. Physiology could be, if one takes references to the heart, lungs, blood, veins, brain, etc. as indicative of the science, Dickinson’s most frequently cited discipline, which Baym sees as “entirely appropriate in the work of a poet preoccupied with the moment when a living creature becomes a dead one” (135). She thought about the geological growth of mountains [757], the evolutionary extinction of species [724], and the mechanics of levers and wedges [789]. Several poems deal with chemical knowledge, of which the processes of fire appear to dominate (as in poem 1063: “Fire exists the first in light / And then consolidates / Only the Chemist can disclose / Into what Carbonates”). Poems referencing chemical knowledge regularly compare the almost infinite malleability of material substances with the durability of the atom (impermeable and indestructible), and thus pull in comparisons of the minute particular with the general. Poem 515, for example, plays with the distinctions drawn between the concepts of the large (“Crowd,” “General Attendance,” “Multitudes”) and the small (“Atoms,” “Individual,” “each separate Consciousness”) to ask “What Duplicate – exist – / What Parallel can be – / Of the Significance of This – / To Universe – and Me?” She defines the inflexibility of the atom in poem 1191 “The pungent atom in the Air / Admits of no debate –” and its permanency in poem 1231, where she likens the atom to “Immortality.”

Dickinson scholar Hiroko Uno, and many others who read for scientific themes in her poetry, understands the proliferation of such references as representing the poet’s “struggle to cope with science’s threat to faith” (95). Baym agrees, but differs from the “leading critical view” that sees Dickinson’s poetry of science as “evidence of a heroic struggle to reconcile an abiding religious faith with the destabilizing implications of scientific findings” (136). Instead, Baym claims that the poems in which the gulf between science and religion is widened, though often expressive of religious agony, tend to more frequently side with the scientific perspective, and thus appear “more like principled attacks on the religious orthodoxy permeating local intellectual life” (136). In either case, Dickinson’s poetry displays her attempt “to find her own solution” (Uno 95) to these competing ideologies by adapting, criticizing, and qualifying concepts both religious and scientific through a poetry that, to borrow Miller's terminology above, exercises linguistic autonomy, disrupts structures of authority, and undermines traditional patterns of language.

Before examining a specific poem that I think displays how Dickinson's interest in science and her attention to the minute inform operating tensions between the visible and the invisible, matter and faith, and the small and the large, I think it important to address an additional element of Dickinson's biography that more securely places her works into my study of the microscope. Her poetry does not merely fit with my study by means of its connection to science generally understood, but more specifically through her invested interest in optics, an interest informed by a long-struggle with an indeterminable and painful eye condition. Just as in the case of Nietzsche's debilitating myopia discussed above, Dickinson scholars have attempted to demonstrate how her fatigued and aching eyes influenced her thoughts and expressions concerning vision, and how vision and thinking are intimately linked in her poetry.[257]

Descriptions of her agonizing experience occur time and again in her letters. In an 1864 letter to her sister Lavinia, for instance, Dickinson writes, "I have been sick so long I do not know the Sun" [296]. Later in 1865, she writes to Louise Norcross, "[y]ou persuade me to speak of my eyes, which I shunned doing, because I wanted you to rest … the snow-light offends them, and the house is bright … Mother and Margaret … father …

[257] Although it is well known that Dickinson had eye discomfort—she stayed in Cambridge for extended periods throughout 1864 and 1865 while receiving treatment by eminent ophthalmologist Henry Willard Williams—the specifics and origins of the discomfort are not. This is primarily due to the scarcity of medical records and laboratory reports. Sewall, in collaboration with ophthalmologist Martin Wand, looks at the famous daguerreotype of Dickinson taken at Mount Holyoke to point out that her right cornea appears to deviate, suggesting that the condition was likely "strabismus," or "exotropia," a misalignment of the eyes resulting in a failure to simultaneously focus both on the same image. Though the condition may be caused by different factors—violent impact to the head, prolonged disease, etc.—Wand and Sewall argue that Dickinson's condition was likely inherited from her mother, whose portrait, painted by the "meticulously accurate artist" O.H. Bullard, displays a similar deviation of the right cornea. Others, like psychiatrist John Cody, have proposed that the illness was psychosomatic, a manifestation of an imbalance generated by a troubled relationship with her mother. Still others, such as Hiroko Uno, biographer Polly Longsworth, and physician Norbert Hirschhorn, believe that the illness was a form of iritis/uveitis, an inflammation caused by bacterial infections associated with diseases like tuberculosis and syphilis. Despite the many attempts to define the illness, none have been especially persuasive. As Uno points out "all the theories about Dickinson's eye disease are hypothetical as long as the medical record of her eyes by her physician is not found" (259). See Wand 400-6, Guthrie 9-11, 179, and Uno 129, 259.

and Vinnie … 'cannot see why I don't get well.' This makes me think I am long sick, and this takes the ache to my eyes" [302]. Thomas Johnson, editor of Dickinson's letters, notes that tropes involving water become "especially predominant in messages written during the period that [Dickinson] was under treatment for her eyes" (441), such as in a letter to Susan Gilbert Dickinson, where she writes, "[y]ou must let me go first, Sue, because I live in the Sea always and know the Road. I would have drowned twice to save you sinking, dear, If I could only have covered your Eyes so you would'nt [*sic*] have seen the Water" [306]. James Guthrie interprets such imagery as suggesting that "her eyes may also have been susceptible to tearing" (9). A letter to her friend Joseph Lyman has received the most attention as it indicates to Wand and Sewall Dickinson's contemplation and fear of blindness. Here she writes:

> *An Exile and a Return*
>
> A Calamity. Some years ago I had a woe, the only one that ever made me tremble. It was a shutting out of all the dearest ones of time, the strongest friends of the soul – BOOKS[.] The medical man said avaunt ye books tormentors, he also said "down, thoughts, & plunge into her soul." He might as well have said, "Eyes be blind," "heart be still." So I had eight weary months of Siberia. (*Lyman Letters* 76)

Uno reads this message as indicating how "the trauma of eye trouble and painful treatment left a deep scar upon her inner life" (130), and Guthrie sees in it a possible realization that "illness was becoming a way of life for her," that she would be forced to "curtail her visual activities" (10). Though, as Wand and Sewall write, we "can only speculate about the extent to which the psychological aspect of the fear [of losing eyesight] from such a disorder might have influenced Dickinson's life and works," the clear "calamity," as presented in the letter, "is enough to justify the attention we can give to this problem" (401). That is, we are justified in looking for how the poet's eye illness could have heightened her thoughts on the value of seeing, a project Uno addresses by locating Dickinson's use of terms connected with eyes and sight.

"Because the condition of her eyes was bad," Uno argues, "Emily Dickinson must have become especially concerned with the theme of sight" (133). Searching for terms like “eye,” “eyes,” “see,” and “look,” (and all variant spellings/capitalizations) Uno discerns periods of increased usage that align with Dickinson’s experiences of eye trauma and treatment. About nine percent of the poems written during her most productive years, 1858-66, will refer to “eyes;” for verbs like “look” or “see,” that number more than doubles.[258] Terms of sight decrease after 1866, but increase again around 1872, about the time her friend Mrs. Holland had one of her eyes surgically removed. In these poems, Dickinson characterizes her eyes as “weary” [1050], “clumsy” [500], “finite” [327], and “Dying” [547]; she routinely laments their frailty, saying that they are “Unqualified to scan” [353], “heedless” [194], “Cheated” [627], “unfitted” [574], “unfurnished” [685], “narrow” [696], and “ignoble” [800].[259]

Focusing on those poems that include references to sight (roughly 500 in all), Uno works out two predominant themes: firstly, poems where the loss of vision is characterized as a kind of magical experience, one that allows those forced into darkness to achieve a clearer, spiritual vision and to obtain “a real recognition of natural beings for the first time” divorced from the uncertainty of “finite eyes” (136); and secondly, poems that connect blindness with despair and death. Poem 419, for example, explores the positive and spiritual registers of losing one’s sight through the common experience of becoming acclimated to the dark:

> We grow accustomed to the Dark –
> When Light is put away –
> As when the Neighbor holds the Lamp
> To witness her Goodbye –
>
> A Moment – We uncertain step
> For newness of the night –
> Then – fit our Vision to the Dark –
> And meet the Road – erect –

[258] Uno provides a more specific breakdown: the “word *eye* or *eyes* is used in 16.74% of her poems written in 1862, and in 19.32% of those written in 1863; while it is in 9.33% of her poems taken as a whole. The verb related to sight, *look* or *see*, is used in 35.24% of the poems written in 1862, and in 26.78% of those written in 1863; while it figures in about 19% of the total work” (133).

[259] Biographical readings can, of course, threaten to become reductive and limiting. It seems fairly obvious that Dickinson’s poems about the failure of seeing are connected to her experiences with failing eyesight, but this connection ought not eclipse readings of her works that promote the poems’ imaginative material divorced from the biographical. Reading her poems in the context of her illness generates interesting and important subtexts, but the biographical is only one scale amongst many.

And so of larger – Darknesses –
Those Evenings of the Brain –
When not a Moon disclose a sign –
Or Star – come out – within –

The Bravest – grope a little –
And sometimes hit a Tree
Directly in the Forehead –
But as they learn to see –

Either the Darkness alters –
Or something in the sight
Adjusts itself to Midnight –
And Life steps almost straight. [419]

The inner life of reflection, and of bravely confronting the deeper and darker aspects of the soul, parallels the experience of acclimating vision to darkness; in both cases, though the threat of running straight into a tree is ever-present, one must, after a little groping around, take a straight step forward without knowing the way. This might be called "Faith," and is something one "learns to see" by fitting "Vision to the Dark," that is, by learning to live without exterior sources of light. The notion that clearer vision accompanies blindness is made more explicitly in poem 1714:

By a departing light
We see acuter, quite,
Than by a wick that stays.
There's something in the flight
That clarifies the sight
And decks the rays. [1714]

Obviously, for one accustomed to seeing objects with the eyes, departing light does not make the object more easily perceivable. So the "acuter" vision, that "clarifies the sight" and comes to the fore as the object recedes, as it is "in flight," and "departing," refers not to the apparatus of sensing (seeing) a thing, but rather to the speaker's recognition that seeing involves the mediation of subjective value, the recognition that "[w]hen a thing is vanishing in darkness, it looks more valuable than before" (Uno 135). The ability to "see," for Dickinson, does not merely refer to the eyes' visual perception of an object's sensible qualities, but also to its invisible registers of meaning, spirituality, and beauty that are only present when the thing fades from view.

Dickinson's "spiritual vision," though linked with "faith" and made apparent only after blindness overtakes sight, is nonetheless connected with the eye, and prominent in those poems where "eye" receives a capital "E." Poem 939, for instance, begins "What I see not, I better see – / Through Faith – my Hazel Eye." "Eye" here and elsewhere refers to the subjective self, apart from immediate visual perception, that contains the power of Faith—a clearer manner of seeing; whereas the small *eye* "is usually powerless, the big or capitalized *Eye* has an unusual power to see things usually invisible" (Uno 137).[260] "Faithful seeing," defined negatively, the opposite of what we typically mean by seeing, is a *preferred* seeing, as poem 939 concludes, "jealous Daylight interrupt" that which she sees with her "Hazel Eye," and lights consequently "mar thy perfectness – ." Some things can only be seen, and can be seen better, with Faith; that is to say, some things can only be seen *without* eyes. In these poems, Dickinson appears to venerate the loss of sight as a means of access to truths unseen.

This first group of poems, then, treats the loss of eyesight with great esteem; only by becoming blind does the "inner" or "mental" eye see reality's spiritual dimensions. Other poems, however, display greater pessimism towards blindness, particularly by drawing links between sightlessness and death. For Dickinson, "to live" is often synonymous with "to see," and thus "to die" is, on the one hand, "to see no more," or, on the other, "to no longer be seen." The closing of eyelids is likened to the closing of days in poem 1050, "As willing lid o'er weary eye / The Evening on the Day leans," and to the closing of one's grave in poem 920, "We go no further with the Dust / Than to the Earthen Door – / And then the Panels are reversed – / And we behold – no more." The dead, swallowed by the earth in their graves, are "out of sight" forever, as in poem 255 "To die – takes just a little while – / They say it doesn't hurt – / It's only fainter – by degrees – / And then – it's out of sight." The figure of death is frequently characterized by association with vision: in "I like the look of Agony" she writes, "The Eyes glaze once

[260] Faith is further linked with this kind of "spiritual Eye" in poem 915: "Faith – is the Pierless Bridge / Supporting what We see / Unto the Scene that We do not – / Too slender for the eye."

– and that is Death – [241]; it has a "look" in "There's a certain slant of light" [258]; and it is the "putting out of Eyes –" in "Renunciation" [745]. In "Death leaves Us homesick," she compares those still living who have lost loved ones to those who, having lost something else of value, are left only with a continued, fruitless, looking: "Through all their former Places, we / Like Individuals go / Who something lost, the seeking for / Is all that's left them, now –" [935]. In 1049, Death appears as pain's only acquaintance, then vanishes from view; Death comes, relieves the sufferer of pain, "tenderly assists Him / And then absconds from Sight."

In poem 465, "I heard a Fly buzz – when I died –," the speaker chronicles her own death as she describes her deteriorating senses, losing her eyesight in the process. A small crowd surrounds a patient, presumably lying on her deathbed, who hears the buzzing of a fly during the periods of stillness that alternate with the loud heaves of sobbing made by the onlookers. Those onlookers are reduced to "Eyes" that peer at the dying speaker and wait to "witness" the "last Onset" of the final breath. She completes her will in stanza three, "signing away" the portions of herself that can be assigned, and then, at the moment of death,

> There interposed a Fly –
>
> With Blue – uncertain stumbling Buzz –
> Between the light – and me –
> And then the Windows failed – and then
> I could not see to see – [465]

As the sounds of the room—the gathering and heaving, the ins-and-outs of breaths, reminiscent of the crashes and falls of ocean waves, the ticks of the clock's second hand—fade away, the last sensation still available to the speaker is her sight. Color imagery replaces the auditory; the "Blue," isolated by the interrupting dash, offsets the buzzing of the fly, overtakes it, confuses its adjectival meaning of "gloomy" with the noun, the color of the fly, between she and the light. Two "lookings" are implied—the "Eyes" beholding the speaker or death itself, and the speaker beholding the light, her last connection with the physical world. The eyes, the proverbial "Windows" to the soul, fail—the sensible world fades, and the light departs. Perhaps "willing lid" has closed “o’er weary eye,” or perhaps vision closes on itself without minding the lid. In either case, the dying speaker’s sight persists, despite her inability to see, until the last moment, when brought to the absolute limits of knowledge, she can no longer understand, describe, or “see to see.”

Whether or not Dickinson’s eye illness directly resulted in a heightened interest in vision (for her, anyway), it seems fair to say that the theme of sight was important to her as it appears in a significant number of poems where thematic tensions, like light and dark, visible and invisible, material and spiritual, life and death, manifest. These poems that deal with vision present deep reflections on the poet’s manner of connection to the world and her faith in both the seen and the unseen; the counterpoised and often contradictory use of “seeing,” as referring both to the faithful vision of the spiritual and the empirical vision of the physical, displays the relative nature of truths assumed objectively visible and those subjectively invisible. Considering her fascination with the sciences, and her working of scientific concepts and terminology into her poetry, it makes sense that the science of vision—optics—would be of special interest to her.

Dickinson likely became familiar with the advances in optical science, especially the uses of instruments like the microscope, telescope, and camera, by reading Denison Olmsted’s *A Compendium of Natural Philosophy* and his *Compendium of Astronomy* at Mount Holyoke. The first of these prescribed textbooks contains a section on optics that includes diagrams and descriptions of a compound microscope, a reflecting telescope, an astronomical telescope, and a portable camera obscura, and provides for the poet a kind of optical dictionary of specific terms (convexity, concavity, perihelion, diameter, etc.), and concepts (reflection, refraction, measurements, etc.). Similarly, the *Compendium of Astronomy* explains the vastness of celestial objects, their sizes and distances, while providing mathematical and astronomical manners of description. Aside from her textbooks, Dickinson may have learned about the mechanics of vision and the properties of corrective lenses from her numerous conversations with her teachers at the Academy and her personal physicians. According to Guthrie, Dickinson appropriated from the astronomer “not only the primary tool of his trade, but also his methods, and especially his terminology,” converting “astronomical principles such as the parallax, planetary motion, and the solstice" (34) into models for understanding distance, alienation, and faith, and for voicing the conflicts that "such new discoveries may have imposed on her religious cast of mind" (Uno 149).

One instance where Dickinson's knowledge of optics is displayed can be found in the second stanza of "The Admirations – and Contempts – of time –":

> 'Tis Compound Vision –
> Light – enabling Light –
> The Finite – furnished
> With the Infinite –
> Convex – and Concave Witness –
> Back – toward Time –
> And forward –
> Toward the God of Him – [906]

"Compound Vision," a phrase that Dickinson scholars often point to as the poet's manner of phrasing the combination of physical and spiritual seeing, indicates her knowledge of lens combinations comprising the microscope and telescope as detailed in Olmsted's *Compendium*. Knowledge of optics—the bringing together of convex and concave lenses and the manipulation of light sources—is here interwoven with the larger scopes of finitude/infinitude, projections of past and future, and God.

According to Uno, Dickinson seems to have been especially interested in optical instruments primarily due to their "function of making 'visible' the things that are usually invisible to the naked eye" (150). These instruments provide users with the power to see things that "Eyes were not meant to know" [451], that is, they allow users to take on a power traditionally reserved for God, a regular theme in her poems that convey optical imagery. In poem 443, Dickinson associates a certain fear with this power: seeing that which "Eyes were not meant to know" refers both to the expansive cosmos unavailable to unaided sight as well as to the inner life of the individual, two fields of vision that ought to be available to God alone. She voices the concern in "I tie my Hat – I crease my Shawl –":

> I tie my Hat – I crease my Shawl –
> Life's little duties do – precisely –
> As the very least
> Were infinite – to me –

I put new Blossoms in the Glass –
And throw the old – away –
I push a petal from my Gown
That anchored there – I weigh
The time ’twill be till six o’clock
I have so much to do –
And yet – Existence – some way back –
Stopped – struck – my ticking – through
We cannot put Ourself away
As a completed Man
Or Woman – When the Errand’s done
We came to Flesh – upon –
There may be – Miles on Miles of Nought –
Of Action – sicker far –
To simulate – is stinging work –
To cover what we are
From Science – and from Surgery –
Too Telescopic Eyes
To bear on us unshaded –
For their – sake – not for Ours –
’Twould start them –
We – could tremble –
But since we got a Bomb –
And held it in our Bosom –
Nay – Hold it – it is calm –

Therefore – we do life’s labor –
Though life’s Reward – be done –
With scrupulous exactness –
To hold our Senses – on – [443]

The poem effectively distinguishes two worlds that each personal individual inhabits, expressed in another poem (that also displays knowledge of astronomy) as “The Outer – from the Inner” [451]. The opening lines are filled with seemingly trivial “Little duties” of the outer world, such as tying down her hat and shawl and replacing flowers in a vase. They also include a remarkable description of an everyday occurrence so common and unimportant that to acknowledge it implies its brute immediacy, the wiping away of one of the petals that had clung to her gown. We are often defined by such “Errands,” or, at least, by our willingness to allow these errands to occupy our thoughts—the speaker calculates how long until it is six o’clock, presumably to schedule the many things she has yet to do. And yet "Existence," her sense of her inner self, strikes her, momentarily interrupting her "ticking" (her counting of things to do and the time left to do them). That inner world, one's subjectivity divorced from actions, cannot be put away, and announces itself most strongly "When the Errand's done." Each of us, the speaker insists, has a "Bomb … held … in our Bosom," an explosive subjectivity that, if directly witnessed, if seen "unshaded," would shock the beholders ("'Twould start them").We must, therefore, "do life's labor … With scrupulous exactness" to maintain the image of the normal "completed Man / Or Woman;" we must "cover what we are," even if such simulation stings us to do. Here, then, lies the threat of "Science": it's "Too Telescopic eyes" might reveal the inner world, and in its revealing, could lead to the desire to remove it. Thus the significance of "Too" as homophone of "Two": both "Science" and "Surgery" are linked by means of their "Too Telescopic eyes." The powers of sight made available by optical instruments reflect those that ought to be reserved by God, who alone has direct access to our thoughts.

The impetus for reading a connection between "Telescopic eyes" and the "eyes of God" comes from two other poems where the link is more explicit. The first is found in poem 413:

> I never felt at Home – Below –
> And in the Handsome Skies
> I shall not feel at Home – I know –
> I don't like Paradise –
>
> Because it's Sunday – all the time –
> And Recess – never comes –
> And Eden'll be so lonesome
> Bright Wednesday Afternoons –
>
> If God could make a visit –
> Or ever took a Nap –
> So not to see us – but they say
> Himself – a Telescope
>
> Perennial beholds us –
> Myself would run away
> From Him – and Holy Ghost – and All –
> But there's the "Judgment Day"! [413]

The speaker here laments both the discomfort she feels on Earth, "at Home – Below –" and what she assumes will be ultimate boredom in Heaven, "the Handsome Skies." She doesn't "like Paradise" because there "it's Sunday – all the time –" with no breaks, no "Recess." She would run away from this fateful destination if she could, but, since God's vision is essentially telescopic—unblinking and all-seeing, God never "naps," he beholds us perennially—she understands the fruitlessness of any attempt. The poem not only organizes a spatial distance between the speaker and the afterlife ("Below" and assumedly "above"), as well as a temporal distance ("all the time" and "Perennial" while implying the relatively short experience of a life-span prior to "Judgment Day"), but also suggests that the telescope serves as a kind of bridge for God's vision between the heavenly and the earthly. The telescope receives a negative connotation, here, as complicit with God's power over the speaker, who wishes to avoid the monotony of the afterlife.

The second poem where the poet connects optical-aided vision with that of God's begins "Of Consciousness, her awful Mate":

> Of Consciousness, her awful Mate
> The Soul cannot be rid –
> As easy the secreting her
> Behind the Eyes of God
>
> The deepest hid is sighted first
> And scant to Him the Crowd –
> What triple Lenses burn upon
> The Escapade from God – [894]

Like "I tie my Hat – I crease my Shawl –" [443] and "I never felt at Home – Below –" [413], "Of Consciousness, her awful Mate" suggests the existence of two parallel worlds: the outer world seen by the crowd, and the inner world that one hides away, to be seen by God alone. The speaker's inner world is here again something she feels she must hide, though to truly "cover what we are" is impossible. The verb "secreting" is especially interesting. It might refer to the process of "secretion," here the slow release of the "Soul," or inner world, mingling with the outer, or it could be a play on making the noun "secret" a verb, and mean "to keep quiet, to keep hidden," thus complementing the theme of burying the inner world as deeply as possible, keeping it from view. Again like poem 413, the speaker is resigned to the fruitlessness of her endeavor, in this case suppressing the inner world, for, even if it remains undetectable by "the Crowd," it will nevertheless be witnessed by God; God's "triple Lenses" perennially "burn upon" the soul. However, unlike poem 413, here God is not himself a telescope, but merely uses one: the "triple Lenses" implies the two lenses in his optical instrument, with the third being his eye. With telescopical or microscopical power (either could apply), God sees the speaker's "secrets." Moreover, God's lenses are not simply "seeing" the speaker, but "burning upon" her, which might connect the image on the telescopical/microscopical lens (starlight on the telescope, flame or reflected sunlight on the microscope) with the traditional understanding of God as he who burns the sinful.

Dickinson's reflections on nature as part visible/part invisible, and on the perception of this "compound" nature by means of "compound" vision, brought her to question claims to truth that depend strictly on either empirical sensation or spiritual faith as necessarily incomplete. In other words, her concern with the theme of sight, perhaps motivated by an intense experience with eye illness, manifests in these "optical poems" which, like many others that exercise scientific themes, display a deep-seated tension she feels in the confrontations between science and faith.[261] "She was skeptical," Uno argues, of the increasing prevalence of optical instruments, "and almost afraid of their influence upon her inner world" (168). At the same time, she was as skeptical and afraid of "the unrelenting exhortations" of religious institutions, "to relinquish reason for faith" (Wolff 101). Moreover, as the poems cited above indicate, she appears to be afraid of God himself, whose optically superior vision disturbs, rather than comforts, her speakers. The questions of scientific and religious compatibility, and the incalculability of both the vast and abstract, as well as the immediate and sensible, underwrite her poems on optics. Uncertainty cloaks them all, implying the poet's desire to "to find her own solution"

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[261] Among other themes, of course. See poem 883 where the speaker references light, the sun, and the lens to venerate the poet as a kind of optical medium that brings the limits of an age into focus, and poem 433, where she recognizes the importance of forgetting (and the impossibility of teaching one how to forget) by referencing telescopes as instruments of knowledge more widely understood. See also poem 974, where imagery related to the camera—its "Flash," "Click," and "Suddenness"—is used to characterize the "Soul's distinct connection / With immortality."

(Uno 95), to reach clarity, security, and certainty. Taking these groups together—those poems that indicate the value of sight mediated by faith, of "seeing" expanded beyond the physical perception of the eye, and those that display the agony of losing sight in connection with death—along with those more specifically involved with optical science, we get a sense that Dickinson longed for certainty in both types of perception, the empirical and the spiritual. This dilemma appears in poem 185 which, due to its reference to the microscope, will receive my special attention.

Emergen(-see!*) and Surgery*

> "Faith" is a fine invention
> When Gentlemen can *see* –
> But *Microscopes* are prudent
> In an Emergency. [185]

Poem 185 is a short poem, a little poem. It could be spoken in a single breath. The simple, straightforward rhyme scheme (*x a x a*) makes 185 appear as either a limerick (with just four rather than the traditional five lines) or as a piece of sage advice, an axiom. Its small size already suggests its microscopical content, as does the sound of its only rhyme: "see." Said twice, first in line 2, "*see*," and then line 4 ("-cy"), the sound emphasizes the action of "looking," of seeing an object itself, and then again up-close. It is written in a variation of ballad meter (Dickinson's favorite). It is a quick read, fast-paced, silly and serious. Only its details slow us down, lending to them a sense of importance inversely proportional to the ease of its reading.

The original version of poem 185 was embedded in a letter written to Samuel Bowles sometime in 1860. Like many of Dickinson's posthumously published poems, "'Faith' is a fine invention" appears in several different versions, her handwritten manuscripts having been further handled by editors who had reassembled the smudges, dashes, and stylistic grammar to fit the standards of publication. Most of the other versions add or subtract exclamation points after "see" (line 2) and "Emergency" (line 4), or omit the quotation marks around "Faith" (line 1), or substitute the dash after "see" with a semicolon (line 2), or revert the capitalization of terms not beginning a line, e.g. "gentlemen" (line 2), "microscopes" (line 3), and "emergency" (line 4). The most obvious change, however, found in five of the seven versions, is made to line two, where the key terms "When" and "can" in "When Gentlemen can *see* –" are changed to "For Gentlemen who see."[262]

The first detail to look at, the quotation marks surrounding "Faith," indicates that this poem, like poems 448 "This was a Poet," 825 "An Hour is a Sea," 254 "Hope' is the thing with feathers," and 943 "A coffin is a small domain," among many others, is one of Dickinson's "definition poems," where she states a commonly understood concept, word, or idiom, and works to undo the assumptions attached with the defined idea. According to Sharon Cameron, Dickinson employs definition as a way of "coming to terms with a discrepancy between what one believes and what one feels" (39), sometimes to tease out unacknowledged registers of meaning, sometimes to mock and ridicule the thoughtless user of such terms.

Additionally, Dickinson's use of quotation marks indicates her extraction of the term from out of a field of definition, a field established by what Cristanne Miller would call "existing (male) authority structures" (134), that she disrupts by "citation." In this way, she takes control over the word, and participates in establishing its meaning. The quotation marks display a moment where a detail—one that has been omitted in later versions of the poem—operates on its reading, especially in its connection with notions of disruption and definition. In 185, the use of quotation marks around "Faith" implies that this concept is "false," or at least "uncertain," a reading amplified by the word "invention" at the line's end, suggesting faith to be a construct, not a self-evident (or God-given) truth.

The unconventional capitalization of certain terms, details that editors again later altered, implore readers to draw connections between Faith, Gentlemen, Microscopes, and Emergency. "Faith" and "Microscopes," as stand-ins for "religion" and "science," suggest simultaneously compatibility (both are "inventions" that Gentlemen may apply as to their liking), and confrontation through comparison (because "Faith" appears first,

[262] I will focus on the version found in *The Letters of Emily Dickinson, v. II*, Ed. Thomas Johnson, 364.

literally "above" the representation of science on the page, the poem implies an organizational hierarchy). "Gentlemen," not "We," announces the gender-as-class conflict, brings the conflict into view, by indicating the role of masculine authority over both science and religion; disturbance of this authority, the authority challenged by Dickinson's unique linguistic violations, is augmented by the final capitalized term "Emergency," a term that is further connected to "Microscope" by means of its etymology. On the one hand, "emergency" refers to "the sudden arising of an unexpected occurrence" (one that disrupts the smooth running of the state of things and demands immediate attention). This definition contains a sense of urgency that complements the quick pace of the poem's meter while it indicates the struggle by "Gentlemen" to maintain control over an incompletely given world (a world disclosed by microscopes). On the other hand, "emergency," from the Latin *emergentia* (the root of *emergence*, and *emerge*) refers to "the process of issuing from concealment," or "to come forth into view … from an enclosed space, [or] area of obscuration" (*OED*). In this way, the microscope is an instrument of emergence—it brings the invisible into view; it embodies the emergency of emergence, what Dickinson must see as an emerging emergency.

The term "Faith," of which we are reading Dickinson's unique "definition," is increasingly untied in the second line with the word "can," again, a small and vitally important detail later changed (from "can" to "who"). Typically, one understands faith to be the belief in something "unseen," something that one *cannot* see, not what one *can*. Dickinson here reverses the commonly accepted understanding of "faith" as belief in that which one cannot see with that which one can see. The speaker is effectively saying that we have faith in the visible world, not the invisible (or perhaps both).

After accepting this reversal of assumptions, one could interpret Dickinson's poem as a "tongue-in-cheek" mockery of those who falsely venerate faith while casually ignoring their very human impulse towards certainty. The "tongue-in-cheek" reading would point out that "faith" is fake when one *can* see, and so Dickinson sarcastically ridicules those who say they "have faith" knowing that they do not truly need it—they *can see*. "Faith" is defined as an "invention," making it a thing or concept to be used, and something typically used when one cannot see or cannot know a potential outcome. Thus, in this poem, "faith" is something used when one knows what is there or what will occur. It would be like a gambler placing a bet when he already knows the outcome, and then feigning "faith," an ironic and funny occurrence since the proper word to describe his opinion would be the opposite of "faith," namely "certainty." Grabbing a microscope then implies the frailty of human confidence and commitment to what we think to be certain—even a "sure thing," a thing that *can* be directly seen. "Gentlemen" who employ faith in the way described seem to say, "I know this thing in front of me; this, that I *can* see, is a sure thing … but let's go get a microscope just to be certain."

This "tongue-in-cheek" reading of poem 185 is one shared by scholars such as Fred D. White, who argues that "[t]o speak of the importance of 'seeing' in the context of faith suggests the follies of believing without understanding or even wanting to understand" (126), and Marianne Erickson, who posits that Dickinson "approaches her crisis of faith not with blind credulity but with scientific skepticism" (45). Aside from her ableist formulation, Erickson's point is mostly satisfactory, as Dickinson's oftentimes preferred method of inquiry, or means of definition, into questions of a metaphysical nature showcases a specialized scientific vocabulary that further promotes minute observation; she regularly undercuts abstract or sublime experiences by recourse to the sensible world before her—indeed, in many poems like this one, "seeing is believing."[263]

But equally pronounced in Dickinson's works are moments where jokes like these point to more nuanced and forceful "truths"—truths told *slant*, as it were.[264] In this case, the formulation—"seeing is believing"—takes on just such a profound seriousness. What does it mean to say that "Faith" is for, or a concept applied to, the visible world, that which we *can* see, if not just to poke fun at pretenders? What does it mean to accept that faith depends on seeing? And why is a *microscope*—an invention itself used to disclose an invisible world, through which the unseen "emerges"—"prudent" for "Faith" in the visible?

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[263] In *Emily Dickinson's Imagery*, Rebecca Patterson argues that the poet's "chief poetic concern with science was to pillage its vocabulary" (113).

[264] See Poem 1129 "Tell all the Truth but tell it Slant – ."

That word “But,” placed after the dash to indicate a separate yet connected element of the definition, usually indicates difference, or disagreement. However, as a logical conjunction, “but” and “and” are substitutable (for example: “I am well, but he is sick” is equivalent to “I am well, and he is sick”). In this case, using “but” instead of a less ambiguous term like “however,” leads to reading “but” more like “and,” or “but also,” to indicate, in addition to a possible objection or separation of the two thoughts, a supplement or amplification of the first by the second. This formulation is, I think, called for by the initial reversal of meaning observed in the use of “Faith” in quotation marks, as an invention applied to the visible. Microscopes are useful, practical, sensible (“prudent”) to further fix the faith we have in the visible world; they are instruments of certainty, where certainty is already faith.[265]

When faith depends on seeing, a “crisis of faith,” or an “emergency,” will call for the use of a microscope; when these emergencies arise, we must *see more*, we must focus on details and attend to the small, in order to more fully fix “faith.” Dickinson does not replace “faith” with “science” represented by microscopes—“those preeminent icons of positivist science” (White 126), and what the reading of “but” as an explicit objection might suggest—but instead here employs science for greater certainty of faith. Thus Dickinson’s subversive, mocking, “tongue-in-cheek” poem takes on more serious implications as it is directed not merely at those who pretend certainty of the unknown and invisible (she likely has religious authorities in mind), but also at those who rely on seeing detached from faith. While jokingly suggesting that faith is produced *a posteriori*, not given *a priori*, self-evidently, or by God, Dickinson balances the equation with the more serious question that perhaps what we see is not always so accurate, reliable, faithful.

Dickinson is comfortable making impossible statements (as in poem 465 “I heard a Fly buzz – when I died –” or 214 “I taste a liquor never brewed –”), but this statement,

[265] This formulation is like a reversal of Søren Kierkegaard’s logic in the *Concluding Unscientific Postscript* that nonetheless arrives at a similar conclusion: that subjectivity is truth. Truth (as subjectivity) depends on objective uncertainty, for only by uncertainty can one make decisions, only through decisions can right and wrong exist, and only in the confrontation of right and wrong can there be truth. “[T]he definition of truth,” Kierkegaard writes, “is a paraphrasing of faith … If I want to keep myself in faith, I must continually see to it that I hold fast the objective uncertainty” (204).

that "'Faith' is a fine invention / When Gentlemen can *see*," though seemingly contradictory, is not of the same sort of impossibility. We do have "faith" in what we can see, though we do not refer to it as such. Microscopes, then, become an invention that serves to extend faith as it extends vision, or that which "Gentlemen *can* see." This is what the microscope does: it dislodges confidence given to faith in the invisible world and increases our certainty in the visible. But Dickinson gives the screw an additional turn by suggesting that the increase of this certainty amounts to an increase of faith—faith that the visible is there to be seen, that the visible *can* be seen. Microscopes are called for during the emergency when faith in the seen world is troubled. In this sense, we use microscopes to make certain that faith remains undisturbed, even when we know that "Faith," though very fine, is merely an "invention."

The insight presented in poem 185—that we use microscopes to fix "Faith," even when we know that "Faith" is an "invention"—resembles Julia Kristeva's connection between language and fetishism in the following way: just as the fetish loses none of its force when recognized by the subject as fantasy (the underlying logic here formulated as: "I know that, but just the same"), so is language based on denial, that is: I know that "the sign is not the thing, but just the same" (Kristeva 37). Poem 185 implies a similar logic of denial: "I can never be certain of the visible world, but just the same." The microscope's expansive view, its display of a microcosmos thriving on the objects that only appear homogenous, would have provided Dickinson with a further variation of this logic: "I know that the thing is not just the thing, but just the same." The formulation correlates with Cameron's understanding of Dickinson's "definition" poems stated above, that they present attempts to come to terms with the discrepancy between what one believes and what one feels, as well as between what one sees and "sees," or what one can and cannot see, what Dickinson could and "could not see to see –" [465].

As my study of the microscope's genealogy has demonstrated, the instrument has always been linked to the disruption of religious concepts. Poem 185 similarly associates microscopes with the religious, and does so in a manner of expression that itself attends to the small. Its microscopical mode may be observed in its precise application of minute details (partial elements small enough to appear as insignificant to her editors, as changeable without disturbing what they must have understood to be the "most authoritative variant," the "abstract Ideal" or "intentional meaning" of the poem, divorceable from tiny grammatical "blemishes"), in the importance it gives to grammatical marks, in its small size, its short and quick pacing, and its etymological play on emergence/emergency. "'Faith' is a fine invention" is highly invested in details as it employs an optical instrument that is defined by bringing details into view. It captures the arguments above concerning particularity and the detail in its connection to the material—or that which we *can* see—and how focus on the small elicits skepticism of the spiritual absolute. But more importantly, the microscope of poem 185 shows us that the vastness and uncertainty that we typically associate with the abstract, unknowable, and spiritual is right before us in the material thing on the microscopical slide.

Science—the mode of inquiry that employs microscopes—is always grounded on "faith," on "guesswork" concerning the visible world. Peirce embraces this aspect of the method, as Dickinson teases out its spiritual register. What cannot be seen by the microscope is highlighted in another short poem, "Surgeons must be very careful," that similarly carries some of the microscopical ideas I have demonstrated above, most obviously by means of the links amongst science, surgical dissection, and the detail/particular.

> Surgeons must be very careful
> When they take the knife!
> Underneath their fine incisions
> Stirs the Culprit – *Life*! [108].

We know that Dickinson associated optical instruments and science with surgery, as in "I tie my Hat – I crease my Shawl –" where her speaker covers herself "From Science – and from Surgery –" from their "Too Telescopic Eyes." Though poem 108 is not explicitly about seeing, its conclusion regarding the "threat of dissection" (of "fine incisions"), what is equally the "threat of the detail," is the same as the "threat of microscopical vision." To see the mystery the "Culprit – *Life*," risks cutting and killing it.[266] When comparing poem 108 with 185, a serious impasse emerges. On the one hand, to gain certainty about life (the reasonable objective of scientific investigation), one must make use of scientific methodology (like dissection) and of instruments (like microscopes). Through these avenues, the scientist attempts to clarify the phenomenon under investigation, a process defined by cutting up and particularizing, that is, by locating and privileging the *details*. Such methods deny religious models, and "Faith" becomes merely a "fine invention." But, on the other hand, to reach certainty risks, indeed *requires*, the eradicating of mystery, of the "Culprit" that underlies and animates the human body: the soul, stirring and hiding, like the thriving of microorganisms, somehow "underneath" the material corpus, beneath the threshold of perception. Certainty, that which Dickinson appears to long for in her poems on science and optics, here destroys vital life forces, and it does so precisely by making incisions, by dissecting, by looking too closely, by *de-tailing*.

Taken together, these poems demonstrate Dickinson's ability to strike an unusual balance between the big (ideas of faith, God, subjectivity, death, and the afterlife) and the small (the details of the everyday, the wiping away of a flower petal, the buzzing of a fly). Her poems contemplate the vastness of the whole from the standpoint of the small; as invested in details, in immediacy, in sensation, in that which we can see (though too often ignore), her works affirm the power and positivity of particularity in its confrontation with the abstract and its disruption of organizational schema. The balance she manages likewise informs her thoughts on religion and science, the material and spiritual, and the visible and invisible. To conclude my reading of Dickinson and my project in its entirety, I turn to an important discourse for which the balance of big and small is especially relevant and that addresses an assumed premise grounding my study of the microscope, namely that, like details, *scales matter*.

[266] According to White, Dickinson may have had William Wordsworth's *Lyrical Ballads* in mind when composing poem 108. In "The Tables Turned," when discussing the "meddling intellect" that "Misshapes the beauteous forms of things," and that interrupts one's direct access to nature, Wordsworth's speaker says, "We murder to dissect" (26-8).

Epilogue.

"All I may, if small": Dickinson and Deep Time; or, Existentialism Expanded

"But," she replied, "here's a universe so large that I'm lost, I no longer know where I am, I'm nothing … All this immense space which holds our Sun and our planets will be merely a small piece of the universe? … This confounds me—troubles me—terrifies me."

~ Bernard le Bovier de Fontenelle, *Conversations on the Plurality of Worlds*

"Anticipation turns out to be the possibility of understanding one's ownmost and uttermost potentiality-for-Being—that is to say, the possibility of authentic existence.*"*

~ Martin Heidegger, *Being and Time*

"I'm beginning to see the Earth so frighteningly small that I believe hereafter I'll never be impressed by another thing."

~ Bernard le Bovier de Fontenelle, *Conversations on the Plurality of Worlds*

The Missing All – prevented Me
From missing minor Things.
If nothing larger than a World's
Departure from a Hinge –
Or Sun's extinction, be observed –
'Twas not so large that I
Could lift my Forehead from my work
For Curiosity.

~ Emily Dickinson, *985*

"What," she cried, "suns expire?"

~ Bernard le Bovier de Fontenelle, *Conversations on the Plurality of Worlds*

Deep Time and the Question of Scale

Wai Chee Dimock broaches the question of scale by first challenging the spatiotemporal paradigms of literary analysis that she thinks have long governed the scholarly field. Academic departments, Dimock argues, have fostered a culture of specialization in which the study of literature has become far too dependent on geographical boundaries and artificial periodizations, both of which have been overestimated as natural and factual. As the field becomes increasingly specialized in this way, scholars are expected to follow suit by sticking to a particular range of questions and taking limited kinds of evidence as significant. She contends that when one assumes and privileges the "American" character of a work or an author, for instance, one necessarily posits a scale by which to measure those works; their meaning correlates with their proximity to that "American" characterization, in its political, economic, or cultural manifestations, as themselves determined by the nation's physical boundaries. Americanists, in today's scholarly climate, cannot extend beyond the borders of America, lest their studies become hardly intelligible due to the loss of that specialized scale. "The discipline," she continues, "is organized as a self-contained fiefdom, its borders policed into a natural fact. Any line of inquiry that suggests a different circumference is suspect, unprofessional-looking" ("Deep Time" 756). Thus scholars who study Herman Melville, or Harriet Beecher Stowe, or William Faulkner (Dimock's examples) avoid the danger of appearing unprofessional by writing about these authors "without ever leaving the borders of America," as if the physical space of America contains them and their works, as if one's spatial locale grants a privilege of autonomy ("Deep Time" 756-7).

The specialized periodization of literature operates in like manner for Dimock. Temporal units, like territorial units, are similarly fictional, unavoidable to be sure, but also "unavoidably artificial, naturalized only at our own peril." "Periodization," Dimock writes, "offers a linear chronology, segments of time neatly sliced, neatly sequenced, neatly segregated, taken to be discretely analyzable," but "[s]uch segments can never fully taxonomize the world" ("Deep Time" 757-8). Historical processes cannot be so easily sliced; they do not readily fit into the boundaries determined by particular events, even when those boundaries are admittedly porous. Fixed periods are always shaped, or misshaped, and the "synchronic planes that come with periodization are no more integral and no more binding than the territorial borders that come with nations" ("Deep Time" 758). Taking territorial or temporal units as natural units—that Melville *is* "American," for example, whose works are exclusively determined by mid-nineteenth century "American" epistemology, morality, etc.—is not only incorrect, but also unproductive.

The spatiotemporal paradigm that directs the domain of inquiry we construct, the range of questions we entertain and the scale by which our findings are evaluated, ultimately limits scholars from reaching the full significance of the works in question. Specializations grounded on misappropriating spatial and temporal boundaries merely remap the "legacies of essentialism and exceptionalism" ("Deep Time" 757) that Dimock sees as built into the logic of academic scholarly production. To undo these legacies, we must view geographical units, nations, as "neither the starting point nor the end point of the modern world," and we must criticize territorial sovereignty as too readily assumed. We must, like Paul Gilroy in his *The Black Atlantic: Modernity and Double Consciousness*, understand the adjective "American" as only partially capturing the complexity of figures such as Frederick Douglass, W.E.B. Du Bois, and Richard Wright. Commending Gilroy as a scholar whose work is especially *not* prefigured by periodized and geographical boundaries, Dimock explains that the writings of Douglass, Du Bois, and Wright "take on their full significance only when they are seen, not as part of a national whole, but as an index to what disputes that *wholeness*" ("Deep Time" 757). By exposing transatlantic ties—Douglass to Enlightenment rationality, Du Bois to German Idealism, and Wright to French Existentialism—Gilroy "make[s] clear that neither a single nation nor a single race can yield an adequate frame for literary history" ("Deep Time" 757). In this way, Gilroy remaps the field of criticism, allowing for an expanded view where new connections may be drawn amongst authors routinely contained in a limited spatiotemporal frame.

To say that our analyses of literature, indeed thinking itself, always assume a scale is to imply the logic of denial given above ("I know that, but just the same"). In other words, it also says that our thoughts necessitate certain limits, for though Dimock criticizes the scales validating analysis today, she certainly does not criticize scale itself. Mark McGurl will agree with this premise in his response to Dimock, noting that we ought not be "naively surprised or inordinately disappointed by the many questionable ways human beings try to scale down the world to make it comprehensible, meaningful, and manageable to them" ("The Posthuman Comedy" 541). Scaling-down is necessary for thinking, for making a state of affairs understandable, workable. Oftentimes we think of things without acknowledging the implied scale of the thought, without recognizing that the thoughts and discussions we have about them are determined by the assumption of a certain scale defining their significance. The microscope reflects the discussion concerning the issue of scale in that, by disclosing a vast microcosmos, the instrument further discloses our assumed scalar limits; the microscope breaks limited concepts of perceptual finitude, making apparent a more expansive scale, and thus making us attentive to how perception and interpretation always includes an assumed, relative, and regulatory scale.

Dimock's challenge to scholars may be summed up in the following statement: we must expand our scales of analysis. It is a challenge she likens to the geological concept termed "deep time" used to understand the profound vastness of the history of Earth apart from the history of humankind.[267] It works with the concept of the *longue durée*, a model put forth by Fernand Braudel and the *Annales School* that emphasizes the long-term historical structures of reality over the short-term of distinguishable events, of duration over episodes, an experimental concept that suggests to Dimock that "different investigative contexts might need different time frames, with no single one serving as an all-purpose metric" ("Deep Time" 758).[268] "Some historical phenomena," she writes, "need large-scale analysis … [t]hey need hundreds, thousands, or even billions of years to be recognized as what they are: phenomena with an extended life, longer than the life span of any biological individual and diachronically interesting for just that reason" ("Deep Time" 758). The *longue durée* pushes imaginings of history to their limits, where the measurement of time is no longer stipulated by the beginning of a territorial entity. Dimock wishes to invoke this historical depth, not to its absolute geological limits (McGurl will suggest we do just that), but to a large enough degree that might enable us

[267] Dimock employs the concept of deep time somewhat loosely, as inspired by its scientific conceptualizations, but not so deep as to render literary analysis insignificant. Deep time basically means "expanded," or "periods much longer than we are used to." Mark McGurl will encourage readers to use deep time in its original geological sense, by which we might "radicalize" Dimock's notion of re-scaling literary studies.

[268] According to Immanuel Wallerstein, *la longue durée* is Braudel's manner of attacking what he sees as "the predominant practice of historians concentrating their energy on recording short-term happenings or events, which he calls (following Paul Lacombe and François Simiand) *l'histoire événementielle*," roughly translated as "episodic history" (82). In place of privileging a certain time or event over the duration of historical structures, Braudel insists that historians expand their parameters to include the regularities of social life whose passage through history "is almost imperceptible, that of man in his relationship to the environment," in order to produce "a history in which all change is slow, a history of constant repetition, ever-recurring cycles" (qtd in Lee 2-3).

to "redraw the map of American literature," where episodic historical dates (1776, the Declaration of Independence, or1620, the arrival of the Mayflower, etc.) may be stripped of their executive forcefulness. Deep time, signifying "a more extended duration for American literary studies, planetary in scope," will, Dimock believes,

> produce a map that, thanks to its receding horizons, its backward extension into far-flung temporal and spatial coordinates, must depart significantly from a map predicted on the short life of the US. For the force of the historical depth is such as to suggest a world that predates the adjective *American*. If we go far enough back in time, and it is not very far, there was no such thing as the US. This nation was not yet on the map, but the world was already fully in existence. The cumulative history of that existence, serving as a time frame both antecedent and ongoing, takes American literature easily outside the nation's borders. A diachronic axis has geographical consequences. Deep time is denationalized space. ("Deep Time" 759-60)

Dimock thinks that the concept of deep time may open an avenue of inquiry that could lead to a new manner of mapping literature, one that seeks and possibly uncovers contemporaneous influence amongst authors living thousands of both years and miles apart from one another. Moreover, the expanded scale of deep time will work to undo the essentialism perpetuated by falsely determinative geographical and temporal boundaries themselves professionalized into illusory notions of natural fact by means of a scholarly climate defined by specialization.

To give a sense of what a map produced by the re-framing or the "scaling-up" of literary analysis might look like, Dimock first connects Malcolm X and James Baldwin by means of their antithetical opinions of the Nation of Islam.[269] After explaining how each twentieth century figure engaged with the Nation of Islam, and how Islamic deep

[269] Each figure, according to Dimock, saw in the Nation of Islam a completely different scale: for Malcolm X, the longevity of Islam, its *long durée* extending back to Muhammad and Abraham, provides followers of all identities with an expansive, non-exclusive, all encompassing depth and width; for Baldwin, however, the Nation's tight circle around Elijah Muhammad made it far too contracted, made it suffocating and stifling to the black artist. This moment in African-American literary history, where Malcolm X and James Baldwin communicate via a shared, though oppositional, engagement with Islam is defined by questions concerning religious and racial identity, the role of the artist in issues markedly political, the value of cultural movements, frameworks, and discourse. We come to know Malcolm X, Baldwin, and many other significant figures of philosophy, political discourse, faith, entertainment, etc. by means of their relationship to the growth of Islam on the global scale, further designating this moment as one in which "*American* literature bursts out of the confines of that adjective, merging with the continuum of world history" ("Deep Space" 763).

time—its *long durée* extending back to the seventh century with Muhammad, and even earlier with Abraham—had shaped their thoughts, works, and reception, Dimock warns that it is a mistake to see the influence of the seventh century Islamic world on American writers as "strictly a twentieth-century phenomenon, affecting only African-American authors" ("Deep Time" 763). The "importance of Islamic deep time," she continues, breaks down standard dividing lines to disclose how the "longevity of this world religion weaves it not only into black history but also into the history of a very different segment of the American population" ("Deep Time" 763). This "very different segment" refers to a group of people rarely mentioned alongside Baldwin and Malcolm X: the Transcendentalists.

The Transcendentalists were avid readers who held comparative philology, comparative religion, and Persian poetry in high esteem. Thoreau immersed himself in Sanskrit texts, writing in his journal "I cannot read a sentence in the book of the Hindoos without being elevated" (266); Margaret Fuller lamented her inability to read Asian languages to better understand the Persian poetry she enjoyed; and Lydia Maria Child, in her three-volume work *The Progress of Religious Ideas through Successive Ages*, wrote extensively on these topics, with chapters on "Hindostan," "Egypt," and "Mohammedanism." "The Transcendentalists were internationalists to a fault," Dimock explains, "[a]nd none more so than Ralph Waldo Emerson" ("Deep Time" 764).[270] Dimock further scales-up Emerson's internationalism by demonstrating his pronounced interest in Islam, his knowledge of classical and foreign languages, and his numerous translations of Persian poetry. According to Dimock, it was through his study of German, and especially of Goethe, that the Islamic poetry of Hafiz (1320-90) and Saadi (1213-92) came to leave such unmistakable marks on Emerson's thinking, "From 1841 to 1879," Dimock informs us, "[Hafiz] was never absent from Emerson's journals" ("Deep Time" 768).

[270] I have pointed to Emerson's global reach in chapter one above, firstly by describing his European travels from Italy to England, and secondly by showing the importance he saw in Plato's travels, who had "imbibed the idea of one Deity" ("Plato; or, The Philosopher," *W* 4:53) from his experiences in the East.

Without enumerating all of the connections Dimock locates amongst figures of Islamic deep time, American transcendentalists, and twentieth century African-American authors, I think her conclusion may be clearly enough understood, that: "[g]oing back hundreds of years, triangulating at every step, reading the Koran by way of German, and looking forward to Malcolm X and James Baldwin by way of Goethe and Hafiz" shows Emerson to be "*American* only in caricature" ("Deep Time" 770). That is, through "scaling-up," new and substantial connections may be made that might link fourteenth century Iranian poets, say, to twentieth century social organizers across the globe, and thus more comprehensive understandings of particular figures can be had, understandings that only emerge through analysis on the scale of deep time. Dimock uses Islam to set the spatial and temporal coordinates, to "trace a thread of continuity spun out of its migration, dissemination, and hybridization," to "render salient a set of relationships" ("Deep Time" 760) that, while nonbinding are nonetheless nontrivial. But one could imagine any number or kind of conceptual scrolls on which to map these relationships. This is what the expanded scale does for Dimock: it discloses the limited nature of specializations over-determined by periods and geographical borders, which consequently flattens authors into one-dimensional caricatures miming a reductive and incomplete spatiotemporal frame, while allowing new maps to be drawn, on a much wider scale, where hybrid influences are fully recognized and developed.[271]

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[271] "Scaling-up" in this way has its literary-analytic corollary in Franco Moretti's work at the Stanford Literary Lab, in what he calls "Distant Reading," a term clearly meant to distinguish it from the "small-scale" analysis promoted by "close reading" techniques. Any specialization, Moretti argues, can only account for a fraction of the literature published at any given period, for there are "thirty thousand nineteenth-century British novels out there, forty, fifty, sixty thousand—no one really knows, no one has read them, no one ever will" ("Conjectures on World Literature" 55). The statistical enormity of unread material presents to Moretti a demand to adapt (indeed eliminate) outmoded categories of literary analysis: "the trouble with close reading … is that it necessarily depends on an extremely small canon … [Y]ou invest so much in individual texts only if you think that very few of them really matter. … And if you want to look beyond the canon … close reading will not do it. It's not designed to do it, it's designed to do the opposite" (57). Close reading, one might argue, is literary criticism's manner of attending to the small, as it is traditionally "based exclusively on one work and devoted exclusively to interpreting that work" (Dimock 622). In this way, the argument proceeds, close reading necessarily creates a limited canon that cannot cover the extended scope of literary production; it obscures the historical structures revealed through deep time analysis as it only attends to qualitative (not quantitative) interpretation, what Moretti characterizes as "at bottom … a theological exercise—very solemn treatment of very few texts taken very seriously" (57). Distant reading is Moretti's "solution" to the limited scope of close reading, whereby scholars study the distribution of specified units across a large number of texts from a wide range of spatiotemporal origins.

Dimock might read my project as one that uses the microscope to set certain spatial temporal coordinates in order to draw connections amongst a series of scientists, philosophers, and artists in a way mindful of, yet not limited by, the geographical and temporal boundaries of the United States. That is to say that my project has always been about scale, both in its focus on the microscope as a scalar instrument, as productive of a manner of seeing that breaks perceptual limitations, and in its scholarly practice, the genealogical pulling from multiple disciplines and sources. The study has attempted to demonstrate how the microscope rose to prominence along with an increasing recognition of the importance of particularity; that is, as the microscope rose, the scales by which we frame our understandings of concepts have been altered: more and more often are the "Big" and the "small" considered to be untenable as static categories, a shift I think must be linked with a rethinking of things as places.[272]

Knowledge of these texts is produced through collaborative efforts of literary-scientists processing data from multiple languages and from multiple periods and places.

Dickinson's "Faith is a fine invention" may easily serve as evidence confirming Moretti's thesis: not only are there far too many literary works produced than could possibly be read, but even those works that can be quantifiably calculated may contain numerous variations, expanding the vastness of literary production that much further. However, "Faith is a fine invention" also indicates how Moretti's hard line against close reading needs softening; if the differences between variations are important—if a substituted word, alternate capitalization, etc. alter our reception of the poem—then a certain debt is owed to close reading as these differences are only recognized by means of analysis on the level of the "small-scale." "While it is true," Dimock argues, "that the traditional close reading … might in fact be antithetical to a large-scale model … there is no reason why a concentrated focus on one particular passage, one particular sentence, even a cluster of words, would be incompatible with such a paradigm" (622). At times Moretti appears willing to entertain a more pluralistic model, where close and distant reading are compatible, but more often he takes the radical stance that the quantitative measures he advocates must replace models of qualitative interpretation. My criticism of Dimock may apply to Moretti, in that his model marks another moment in which the large is privileged to the small.

[272] I might point out that Emerson, Peirce, Melville, and Dickinson were each interested in what one might call "scalar thinking." The passage from "Circles" quoted above may serve as Emerson's articulation of the issue: "Every ultimate fact is only the first of a new series … There is no outside, no enclosing wall, no circumference to us. The man finishes his story, —how good! how final! … on the other side rises also a man, and draws a circle around the circle we had just pronounced the outline of the sphere" (*W* 2:181). To say that one can always draw a larger circle is to say that the scale conditioning one's series of facts can always be expanded; though he was highly critical of microscopical vision, he nonetheless recognized in it and other optical instruments a manner of visualizing cosmic vastness on a much wider scale. Peirce was also wrapped up in issues of scale. To argue that reason is always tied to a relative mode of observation further implies that reason is always tied to a relative scale: "Now it is one thing to infer from the laws of little things how great things, that consist of little things, will act; but it is quite a different thing to infer from the phenomena presented by great things how single things billions of times smaller will act" (1.129). Referring to "things billions of times smaller" indicates Peirce's awareness of the importance of scale, that "big" things and "small" things might communicate, but must be understood in context of scalar variety. When he states in "A Guess at the Riddle" that "we must reject every … general conception of the

However, despite the overlap between my analysis of the microscope and Dimock's model of deep time, with its manner of working through related scalar issues by means of an expanded historical and disciplinary scope, this study can easily be read as the groundwork for a strong opposition to Dimock, to her program of "scaling-up" and her promotion of the *longue durée* approach to literary texts. As I have demonstrated above, the "Big," what could be read as the "scaled-up," has always sustained a superior and privileged position in intellectual inquiry, a position sustained by a pervasive hostility towards the small, the detail, and the feminine, to which we could add Braudel's understanding of the "scaled-down" particular historical episode. Immanuel Wallerstein's summary of Braudel's model of the *longue durée*, the model defining Dimock's use of the term, articulates the problem:

> For Braudel, the mass of "small details" (some dazzling, some obscure) that comprise the bulk of traditional history, which is almost always political history, is only a part of reality, indeed only a small part. Braudel notes that nomothetic social science "is almost horrified by the event. Not without reason: the short term is the most capricious and most deceptive of all durations." (82)

Here again appears the long-standing dismissal of the detail. The approach to literature advocated by Dimock's conception of "deep time," modeled on Braudel's *longue durée*,

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universe, which could ever lead to the conclusion that any given general fact is an ultimate one" (1.405), he is effectively repeating Emerson's point that a larger circle may always be drawn. Peirce sought a balance where the particular and the general, the phenomenon and the law, could be more comprehensively understood as mutually dependent and non-contradictory, a formulation he came to by means of speculating the deep time of science. Furthermore, Melville's *Moby-Dick* is replete with images of scalar distance, from the vast depths of the world found beneath the ocean's surface to the absolute heights of philosophical speculation reached by sailors serenely perched atop the mast-head. Also interesting are Melville's descriptions of scaling-up and down in chapters fifty-five and fifty-six, where the narrator consistently refers his reader to the scales accompanying both realistic and unrealistic portrayals of whales. When describing the skull of the sperm whale in chapter eighty ("The Nut"), Ishmael points out that, if one took "a rear view of its rear head," one would undoubtedly "be struck by its resemblance to the human skull." "Indeed," Ishmael continues, "place this reversed skull (scaled down to the human magnitude) among a plate of men's skulls, and you would involuntarily confound it with them" (275). Recasting the reading of Melville above with the scalar terminology described here would consider the ambiguity between the real and the fictional in "Benito Cereno" as the ambiguity that arises when one uses different scales to measure the same reality. For Melville, scales are never politically neutral, and the means of measurement we employ are determined by structures of authority; to disrupt that authority is to break the scale. Finally, Dickinson's poetry, exploring large-scale concepts of vastness by means of small-scale manners of expression, manages a unique balance of scales in which the particular and the general are given equal executive force. Writing from the point of view of the small, the belittled, the particular, and the detailed, Dickinson reveals the falsity of privileging one scale to another, while displaying the incomplete nature of any absolute measurement.

thus includes a rejection of the small, and by extension its associations with the material and the feminine. Peirce's call to rid science of its metaphysical leanings entailed a demand to limit large-scale analysis and to focus greater attention on the minute, while Melville warns us of the dangers of readily accepting figurative notions of generality at the expense of particularity, and Dickinson presents a body of work that showcases the underestimated power of the small. These figures would likely agree with Schor when she argues, "[t]he need to affirm the power and the positivity of the *feminine particular* [and particularity itself] cannot for the moment be denied" (116). Affirming the power and positivity of particularity, fighting for the legitimacy of the small, what Melville saw as the only way to undo the unjust control of authoritarian structures, might find a corollary in specified and specialized small-scale literary and historical analysis. By advocating for the "scaled-up" approach, one might argue, Dimock is merely reinscribing, oddly enough, a long tradition wherein the "Big" is once again privileged to the small.

This objection, of course, is not the only one to have challenged Dimock's model of deep time; Mark McGurl, for instance, opens his essay "The Posthuman Comedy" with a few more.[273] The first is the historical materialist objection, which might contend that taking too large of a view misses the original horrors contained in specific cultural events (e.g. wars) and artifacts (e.g. those made from slave labor, or those taken as the "spoils" of victory). Dimock's long view signals a "want to acquit culture of its complicity in historical violence," McGurl writes, "dissolving it in a 'deep time' …

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[273] Before running through these criticisms, McGurl summarizes some of the potential benefits of Dimock's use of deep time to scale-up literary analysis:

> According to Wai Chee Dimock, scholars of American literature should study it in a bigger historical context than the one beginning in 1776 or even 1620, freeing themselves in this way from the narrow-minded nationalism that has so often drawn a border around their research. To view American literature in light of the longer *durée* of ancient civilizations is to see Henry David Thoreau reading the *Bhagavad Gita*, Ralph Waldo Emerson the Persian poet Hāfez, and rediscover in these and other extensive sympathies the kinship of American literature with world literature. Dramatically expanding the tracts of space-time across which literary scholars might draw valid links between author and author, text and text, and among author, text, and the wide world beyond, the perspective of deep time holds the additional promise, for Dimock, of reinvigorating "our very sense of the connectedness among human beings" and of dissuading us, thereby, from the wisdom of war. (533)

As will be shown below, McGurl is not fully persuaded by Dimock's argument, though he sees in it an important and workable thesis.

stretched beyond the bounds of any obvious social utility or statute of limitations" (533-4). The model refuses "to contemplate that original horror," and thus risks obscuring oppressor and oppressed while giving up the imperative of social justice. Additionally, the assertion of "deep time" can always be thought of as already a product of history, as "itself [an] utterance of a particular historical situation" (534). Dimock's desire to extend spatiotemporal boundaries, the argument might go, amounts to an abandonment of the particular historical situation conditioning its rise, and thus important "political, economic, and other practicalities recede in her account to become a remarkably frictionless conduit of transnational sympathy and identification" (534). Besides ignoring the specific socio-political elements highlighted by "shallow time," deep time also seems to ignore the technological mediation necessary for communication to occur across hundreds of years and miles, between Hafiz and Emerson, for example. Without attention to the "long chain of objects, institutions, and techniques" of media transmission, a contemporary media theorist might note "how tenuously materialized Dimock's connections across deep time appear to be" (535).

An objection that McGurl does not include, perhaps because of its common sense character, is the plain difficulty of the kind of scholarship called for by Dimock's model. Drawing from all of the sources she recommends—scientific, historical, philosophical, literary, etc.—not to mention the countless sub-branches and specialties of these disciplines, requires the scholar to cross over into areas with which he or she is likely unfamiliar. This means making risky claims due to lack of comprehension, practice, and requisite knowledge, and thus greater possibilities for error; the standard for a good work of scholarship might become a matter of taste, of style, or of entertainment. Perhaps trying to do all things will mean doing none of them very well.

A final objection, again not found in McGurl, might simply point out that Dimock's fundamental argument—that American literature needs to be read in a wider context—could be taken as either intuitively obvious or as not much of a problem to begin with. I think most scholars would agree that large contexts, when connective evidence is persuasively provided (e.g. that Emerson *actually* translated Persian poetry, or that Thoreau *actually* wrote about his admiration of sacred Hindu texts), are by all means acceptable topics in the scholarly field; for many scholars, these kinds of direct causal links are not even required.[274] As a source of political rhetoric used frequently to advance controversial agendas, American exceptionalism is certainly a notion that deserves critical treatment, and some of the connections Dimock suggests we seek may seem unconventional or experimental, but the basic thesis is not especially groundbreaking.

Nevertheless, the thesis that our scales of analysis ought to be widened is one worth promoting, I think, perhaps because it is not groundbreaking, but simply a reminder, a continual push for increasingly diverse and evolving understandings of literary production. What Dimock offers that I find to be chiefly important is the thesis that analysis is determined by the scale one uses to frame the discussion, a thesis akin to one I draw from Peirce's employment of microscopes, that reasoning about phenomena is always tied to a determinative and non-absolute mode of observation. McGurl agrees, both with the premise that literature acts as a kind of "scaling device" ("A Reply to Wai Chee Dimock" 634), and that these scales matter. While each of the objections to Dimock's model of deep time "are persuasive to some degree," McGurl admits that "none of them is able to hold on to the new conceptual territory brought into focus in her audacious lens shifting of literary history" ("The Posthuman Comedy" 535). The "audacious lens shifting" refers to what McGurl sees as a move towards a new literary transnationalism, one that often employs quantitative approaches to literature drawn from tested scientific methodologies. "Dimock deserves considerable credit," he continues, "for broaching the issue of scale in literary studies so boldly, and she is not alone in wanting, in this time of disciplinary duress, to find scientific sanction for the benefits of literature" (536). "Scientific sanction" may be taken as "quantitative analysis," a scale of measurement that McGurl will test in a way that further involves the microscopical.

[274] References to Brahmanic religions can be found throughout *Walden*, as in the closing passage of "The Pond in Winter" where Thoreau writes, "In the morning I bathe my intellect in the stupendous and cosmogonal philosophy of the Bhagvat-Geeta, since whose composition years of the gods have elapsed, and in comparison with which our modern world and its literature seem puny and trivial" (280). Later, he will name Brahama, Vishnu, and Indra, while venerating the reading of the Vedas.

The Limits of Scale, the Ends of the Earth

Beginning with Dimock's initial premise, that we must expand our scales of analysis, McGurl suggests that we "radicalize" the notion of deep time and extend the scales to their absolute limits. The resulting project he terms "the posthuman comedy," signaling a manner of re-thinking the assumed spatiotemporal boundaries as independent from humanity:

> It's more productive, I think, to come at the question of deep time from the opposite perspective, accepting Dimock's challenge to think the periodicity of literary history on a new and larger scale but altering our conceptual orientation to that largeness such that the failure of institutions it predicts … comes into view. This is a project I call the posthuman comedy, a critical fiction meant to draw together a number of modern literary works in which scientific knowledge of the spatiotemporal vastness and numerousness of the nonhuman world becomes visible as a formal, representational, and finally existential problem. It will be aided, first, simply by radicalizing Dimock's expansion of the timeframe in which we view the institution of literature, reclaiming the term *deep time* from her essentially Braudelian usage, which makes it synonymous with a historical *longue durée* measured, at most, in thousands of years. Here instead we will insist upon its original geological meaning. Whether it is the 13.7 thousand million years since the Big Bang, or the 3.5 thousand million years in which life on earth has been evolving, or for that matter the 4.5 thousand million years from now until the earth is incinerated in the heat-death of the sun, the deep time of the earth sciences is difficult to integrate into even the most capacious visions of civilization, national, or institutional continuity. ("The Posthuman Comedy" 538)

McGurl asks that we "reclaim the term deep time" from Dimock's "essentially Braudelian usage," and use it in its original geological meaning, not so much to do away with "small scale" analysis, but to see what the "large scale" of big historicism might produce, might tell us about the continuity of civil, national, and literary institutions. The "biggest," or "most expanded," or "totally scaled-up" version of Dimock's deep time must align, McGurl assumes, with the timeline of the earth itself, which begins with the Big Bang, and will conclude with the eventual heat-death of the earth's sun, marking the necessary boundaries of Dimock's "new conceptual territory."[275]

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[275] McGurl here draws from a generally accepted scientific prediction that as the sun ages the hydrogen composing its core, which is converted into helium via nuclear fusion to generate some four hundred trillion-trillion watts of energy in the forms of heat and light, will run out; as the hydrogen depletes, the

McGurl's "radicalizing" of Dimock's thesis clearly depends on scientific methodology and rationale. The extended vision made available by optical instruments like the telescope and the microscope have allowed scientists to visualize a world far vaster than could previously have been imagined; the extended view has made "scaling-up" in McGurl's sense possible, has made the vastness of the universe measureable, quantifiable. That feature of modernity, of "a continuing expansion of the range of potential human empirical observation, from the subatomic to the cosmic realms" ("The Posthuman Comedy" 540), has rendered unnecessary the application of abstract metaphysical models that assume a contingent and rational universe (as found in the Platonic and Aristotelian traditions), as well as the totalizing religious conceptions of omniscience, perfection, etc. associated with God, to contemplate the vastness of the universe. This vastness has been empirically displayed, made sensible, perceivable, and quantifiable by scientific instruments; we have "scaled-up" our vision to the point in which projecting scalar limits on the immediately perceptible has become the more suspicious practice. As the telescope sees the vastness of the cosmos, the microscope sees the vastness of the microcosmos. That is, the microscope has revealed a vastness found not in the outward distance light-years from the earth, but in the things immediately before us. With the microscope, we have—and here is where Kofman's and Sontag's arguments are especially relevant—recognized vastness in the material, in the thing itself as already disruptive of assumed spatiotemporal boundaries.

burning at the core will spread outward to reach the surface, consequently increasing the earth's levels of radiation, boiling its oceans, evaporating them and turning the planet into a lifeless desert. Eventually, when the hydrogen is completely gone, the sun's core will grow denser and hotter; it will swell, consume Mercury, Venus, and, probably, the earth, as it enters the Red Giant stage of a star's existence (the sun is no longer called "living"). The dying sun will pass through the White Dwarf stage, where it will have shrunk to an Earth-sized ball, and end in the Black Dwarf stage; its outer gasses having been blown into space, the sun cools off completely, and then dies. There are numerous alternate accounts of our world's ultimate fate, including, among others, cyclical or oscillatory models (alternating periods of Big Bang and Big Crunch), the Big Rip, the Big Bounce, Multiverse models, and the Big Freeze, where, in an expanding universe the gas needed to form stars runs out.

The Pressure of the Vast; or, Cosmic Nihilism

The vastness made visible by scientific investigation brings along with it a sense of an *annihilating pressure*, arising from both the fear generated by the knowledge of our scalar limits (the only possible conclusion for this world is its ensured non-existence, for though 4.5 billion years is a long time from now, it is still comprehensible), and the realization of how small humanity appears in comparison. That is, recognition of cosmic vastness makes the human look insignificant.[276] This is what McGurl has in mind when he says that "scientific knowledge of the spatiotemporal vastness" becomes, finally, an "*existential* problem" ("The Posthuman Comedy" 537—my emphasis); it is a problem that demands us to consider objective truths along with the subjective registers of existence, where the quantitative turns to the qualitative. What is the value of any human endeavor when placed on the cosmic scale, a scale both monstrously vast and predictably finite? And so even the "most epic productions" of literature, when matched against this scale of deep time in its geological sense, become "cosmicomically small" (538). Recognizing the vastness of the cosmos inversely demonstrates the minuteness of the human experience, annihilating the significance of any cultural, political, philosophical, or artistic institution. By scaling-up, Dimock can make Hafiz and Emerson appear as contemporaries; by scaling-up even larger, McGurl makes them no longer appear at all.

"In the case of Dickinson," Dimock writes, "that annihilating vastness was part of the institutional and intellectual fabric of Amherst, Massachusetts" ("Low Epic" 617). The scientific education described above that doubtlessly informs many of Dickinson's poems results in, according to Dimock, a "self-advertising drama of size" where

[276] The "annihilating pressure" of cosmic vastness is featured prominently in Bernard le Bovier de Fontenelle's late seventeenth century classic *Conversations on the Plurality of Worlds*, where one of the narrator's chief goals, aside from educating the Marquise, is to alleviate her fear that in the infinitely large scale of the cosmos the earth and its inhabitants are rendered insignificant. After listening to the narrator's arguments for the vastness of the universe and the likelihood of life on other planets, the Marquise confesses, "here's a universe so large that I'm lost, I no longer know where I am, I'm nothing … All this immense space which holds our Sun and our planets will be merely a small piece of the universe? … This confounds me—troubles me—terrifies me" (63). The fear nearly paralyzes the Marquise, who continues: "I'm beginning to see the Earth so frighteningly small that I believe hereafter I'll never be impressed by another thing" (64), to which the narrator replies: "The other worlds may make this one little to you, but they don't spoil lovely eyes, or a beautiful mouth; those have their full value despite all the possible worlds" (64).

"instances of the very large, and the puniness of the human body in comparison, repeat the quintessential epic encounter with alien orders of magnitude" (617). In other words, Dickinson's "scaled" poems reflect both the scientific culture of Amherst—which had displayed the vastness of the micro/cosmos through optical instruments—as well as the pressure of annihilation brought forth by this vastness. Poem 949, for instance, exhibits Dickinson's contemplation of the vast with an implied annihilation of the human:

> Under the Light, yet under,
> Under the Grass and the Dirt,
> Under the Beetle's Cellar
> Under the Clover's Root,
>
> Further than Arm could stretch
> Were it Giant long,
> Further than Sunshine could
> Were the Day Year long,
>
> Over the Light, yet over,
> Over the Arc of the Bird –
> Over the Comet's chimney –
> Over the Cubit's Head,
>
> Further than Guess can gallop
> Further than Riddle ride –
> Oh for a Disc to the Distance
> Between Ourselves and the Dead! [949]

The primary distance the speaker attempts to imagine and measure in Poem 949 is the distance between the living and the dead. The distance is so vast that it requires a scaled-up conception of the cosmos, one equally expansive in both time and space, in all directions and projections, extending far beneath the grass and dirt, further than light can travel, longer than the longest day. When contemplating such vastness, the human fades away, becomes insignificant; the cosmos is beyond our reach as arms cannot stretch wide enough, and eyes cannot see far enough. The vastness of the cosmos is "Further than Guess can gallop," that is, larger than our capacity to formulate hypotheses about it; it is "Further than Riddle ride," or too big for rationale. The beginnings of nearly each line—Under / Under / Under / Over / Over / Over / Further / Further / Further—increasingly pushes the reader into the far-off distance; and as the cosmos is scaled-up, the human-being is scaled-down.

In agreement with Dimock, Hiroko Uno has argued that "with scientific knowledge and her experience of looking through a telescope," Dickinson had "all the more realized the limit of human capability" (155). The annihilating pressure of the expanded scale is something she contemplated and expressed throughout her works—sometimes they take the form of tongue-in-cheek sarcasm regarding human frailty, sometimes agonizing depression, sometimes strong-willed optimism. The "epic encounter with alien orders of magnitude" is oftentimes given "under the aegis of science rather than mythology" (617), but not always, as in poem 540:

> I took my Power in my Hand –
> And went against the World –
> 'Twas not so much as David – had –
> But I – was twice as bold –
>
> I aimed by Pebble – but Myself
> Was all the one that fell –
> Was it Goliath – was too large –
> Or was myself – too small? [540]

This "scaled-down" poem takes an epic encounter and fits it into two short stanzas. The scalar difference is further implicated in the speaker's question about her failure; the bold stance against the world she took has been put down, and she wonders whether it was that the world is just too large or if she is just too small. For Dimock, the "re-scaling" of such epics indicates Dickinson's understanding that, when compared to the extremes of time and space, human endeavors seem puny.

Even conceptions of God are not immune to the annihilating pressure of cosmic vastness now empirically disclosed, as seen in the first stanza of poem 350:

> They leave us with the Infinite.
> But He – is not a man –
> His fingers are the size of fists –
> His fists, the size of men – [350]

God is the traditional "He," and is here once again associated with the infinite. But this God, "rescaled by the new sciences of astronomy and geology," is presented as "oddly primitive … no longer the God in whose image we were made, but Cyclops-like: too big for comfort, too big to be benign" ("Low Epic" 618). The closing lines similarly rescale infinity itself: "Eternity is ample, / And quick enough, if true." The final words suggest a scientific skepticism that eternity is untrue; if it exists at all, it exists contradictorily as "quick." In Dickinson's poetry, human endeavors and conceptions are routinely crushed by "the annihilating vastness of the cosmos" ("Low Epic" 617), where "vastness" becomes a prominent (and terrifying) new limit (or limitless) in scientific models of a scaled-up universe.[277]

"One possible outcome of scaling up," Dimock writes in reply to McGurl, "is of course a quietism, if not nihilism … brought on by the near certainty of extinction from the standpoint of a cosmic *longue durée*" ("Low Epic" 614). Faced with this determinate script, "[m]ost of us, and most works of literature," she continues, goes about its business "blissfully shortsighted, never giving a moment's thought to the catastrophe projected far into the future, but guaranteed to happen" (614). McGurl picks up on this "blissful shortsightedness" when he describes the death of the sun as a "half-acknowledged truth" that "hovers in the background of Dimock's otherwise optimistic account of literature's ability to bridge time" ("The Posthuman Comedy" 538). The half-acknowledged truth again announces the logic of denial, newly formulated to parallel the increasing expansion of assumed scales: an expanded version of "I know that the sign is not the thing, but just the same" might read "I know that the thing in front of me is actually a vast microcosmos, but just the same," and, expanding the scale still further, "I know that the earth is doomed to explode in 4.5 billion years, but just the same." Dimock asks, "How do we wrap our minds around the 'big historicism' that renders our lives negligible?" How can we emotionally deal with the "devastating sense that … human individuation is statistically insignificant, not even a drop in the bucket" ("Low Epic" 616-7), if not by ever renewing the logic of denial?

[277] Poem 374 provides another example of a similar kind of down-scaling when the speaker says, "I went to Heaven – / 'Twas a small Town" [374].

*Being-towards-(*sun*)-death; or, Existentialism Expanded*

As Martin Heidegger reminds us, quoting Hölderlin's "Patmos," "where danger is, grows / The saving power also" ("The Question Concerning Technology" 28). Both Dimock and McGurl want to address the problems (and possibilities) that emerge when we scale-up literature by means of geological deep time from an existential point of view, whereby the only necessary possibility, death, becomes the only means of determining the value of the scale. After accepting "the known outcome" of the earth, Dimock points out that while this "outcome is not in doubt, the routes to it are likely to be numerous, and the content of any particular slice of time … is anyone's guess" ("Low Epic" 614). In other words, the "endpoint neither dictates nor even unduly restricts the range of possibilities emerging at every stage," and again in scalar jargon, "[t]he very big here does not predetermine the very small—quite the contrary" (615). Even if the end is certain—can *be seen*, in a sense, is *in view*—reaching that end is not, is always open to a potentially boundless field of anticipated, but undetermined, possibilities. The big is not determinative, and the autonomy of the small remains intact; this is Peirce's point when criticizing the construction of scientific axioms—that, as Lucretius writes, the "atoms must swerve / a little," that observational aberrations result from the "imperfect obedience of the facts to law" (1.402)—and Dickinson's point when displaying the power of the particular. "The fact that something disappears at the end," Dimock insists, "doesn't mean that it never existed; a subjective sense of freedom is not necessarily a delusion" ("Low Epic" 615). Indeed Dickinson will push the insight all the more to suggest that only through disappearing or retreating is the value of the object ever really felt.

Saying that the sun's death annihilates humanity's significance is like saying that the individual's death annihilates his or her significance. The dilemma resembles Heidegger's discussion of what he calls the "existential-ontological structure of death" (293/249) in *Being and Time*, where he counters that only through foreknowledge of its end, through Dasein's confrontation with death—its dealing with the not-yet-settled "possibility of no-longer-being-able-to-be-there" (294/250), its fundamental *being-*

towards-death—can it realize an authentic and meaningful life; that is, certain annihilation does not render Dasein insignificant, rather, Dasein only becomes significant by means of its certain annihilation.[278] The notion is not lost on McGurl, who, echoing Heidegger's thought that "as long as any Dasein is, it too *is already its 'not yet'* (288/244), writes "in the 'long now' of entropic deep time, we are in a sense *already* contemporary with our own extinction" ("A Reply to Wai Chee Dimock" 634).[279]

The existentialist insight, the reversal wherein death begets significance, is something Dickinson contemplated, and perhaps stated most overtly in poem 360:

Death sets a Thing significant
The Eye had hurried by
Except a perished Creature
Entreat us tenderly

To ponder little Workmanships
In Crayon, or in Wool,
With "This was last Her fingers did" –
Industrious until –

[278] Having established Dasein as the being for which Being itself is an issue, Heidegger moves on in part one, chapter one of *Being and Time* to argue that without the possibility of *not-being*, without recognizing the "possibility of no-longer-being-able-to-be-there" (294/250), Being as such could not be important to Dasein. The possibility of not-being is thus fundamental to Dasein's way of being. Because this possibility is only present *as a possibility* and never experienced as such, it defines Dasein as incomplete, as a being with something *always-not-yet-settled*; this possibility of not-being is that *towards which* Dasein must "comport itself." Death, as the possibility of Dasein's own non-being, thus structures Dasein's fundamental constitution as *being-towards-an-end*; death sustains Dasein's necessary dynamic movement towards the not-yet, the "ahead-of-itself," gives it its meaning as the anxious "being held out into the nothing" ("What is Metaphysics?" 91), and thereby provides the *very possibility* of a significant and authentic existence. Death is distinctive in that it is the only possibility that must come-to-pass; it presents a peculiar certainty and an indefiniteness in that though it must necessarily come its coming is possible at *any possible moment* (302/258). Confronting its impending death is Dasein's manner of fully assigning its potentiality-for-Being. That is, Dasein can deal with death either authentically or inauthentically. Ignoring death, Heidegger explains, is "an inauthentic Being-towards-death" (303/259). If Dasein evades death, it thereby evades its own way of being, which amounts to living an inauthentic life that fails to address the disclosure of Dasein's world. However, Dasein can choose itself, can "determine its own character as the kind of entity it is" (303-4/259), and can recognize itself as "*already its 'not yet'*" (288/244). The anticipation of the possibility of death "turns out to be," Heidegger argues, "the possibility of understanding one's *ownmost* and uttermost potentiality-for-Being—that is to say, the possibility of *authentic existence*" (307/263). Dasein "can *be* authentically only by anticipation" (310/265) of death, and in this way, finitude begets significance.

[279] McGurl explicitly names Heidegger as his resource: "For the individual, meanwhile, as we learn from Martin Heidegger and from existentialist thought more broadly, the foreknowledge of death is always with us, always as Dimock puts it 'retrojected,' the source of the ongoing emotional background radiation we call anxiety" (634-5).

The Thimble weighed too heavy –
The stitches stopped – themselves –
And then ’twas put among the Dust
Upon the Closet shelves –

A Book I have – a friend gave –
Whose Pencil – here and there –
Had notched the place that pleased Him –
At Rest – His fingers are –

Now – when I read – I read not –
For interrupting Tears –
Obliterate the Etchings
Too Costly for Repairs. [360]

Like other poems, poem 360 begins with a thoughtful, oftentimes counterintuitive, observation or aphorism, here concerning the soul’s *being-towards-death*, and how the world of “Things” comes to be designated as significant.[280] After the initial statement, the speaker then provides a series of examples to demonstrate her point. Stanza one provides the image of a “perished Creature,” the body of a dead animal, perhaps on the side of the road or walking path, that arrests her attention, directs it towards death, and thereby assigns it meaning and value. Stanzas two and three describe handicrafts or “Workmanships” made by a person while alive that remain after that person dies, things like drawings or knittings that are later packed away in closets and “put among the Dust,” augmenting the link between the dead and the thing. Stanzas four and five present a book containing handwritten marginalia that once belonged to a friend who had passed away; the marks he had made now make the speaker weep as they force her to contemplate his death—her tears, falling on the page, begin to erase the “Etchings” which, because of her friend’s passing, have become significant, have now become “Too Costly for Repairs.” Dickinson’s “hurried Eye” could be Dimock’s “blissful shortsightedness,” McGurl’s “half-acknowledged truth,” or Kristeva’s “I know that, but just the same,” while the eye’s arrestment by the “perished Creature” indicates Dasein’s confrontation with finitude, and the speaker’s final breakdown the annihilating pressure she feels from the confrontation.

[280] As discussed above, the capital “E” in “Eye” indicates the “mind’s eye,” or the “soul’s eye,” one that can see depths in the material.

Though we may be able to forget and ignore, evade, cover up, and flee the certainty of our finitude most of the time, what Heidegger would deem an *inauthentic being-towards-death,* there will always be things around to re-direct our attention, to prompt our anticipation of death, and to force us to recognize our "*ownmost* and uttermost potentiality-for-Being," as the possibility-of-not-being turns into the only "possibility of *authentic existence*" (*Being and Time* 307/263).[281]

The discussion concerning the issue of scale between Dimock and McGurl thus drifts into the existential, where this important reversal is again played out, and the insignificance provoked by finitude again begets authenticity. On the expanded scale of deep time, the reversal is effectively "scaled-up" such that the issue of *individual being-towards-death* now covers the entire universe, as a kind of *being-towards*-sun-*death*. In this way, "[t]he human organism, pitifully small on its own," becomes "indexically vast as a node of space and time" ("Low Epic" 616). This is the result of the expanded scale fostered by the scientific use of optical instruments: by displaying the insignificance of humanity (as a mere finite speck in the vast cosmos), it has ultimately made human endeavors appear that much more important.

Taking a cue from "Death sets a Thing significant," we can find in Dickinson's poetry, in addition to the recognition of human finitude, an existential opposition to "the

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[281] I recognize that Object-Oriented Ontology (OOO), as practiced by Graham Harman, Quentin Meillassoux, Ray Brassier and others, works with similar problems and draws similar conclusions. Especially relevant is the risk of an overestimated anthropocentrism, where the scaling-up of Dasein's being-towards-death eclipses that of non-human objects. A basic premise of OOO entails a de-privileging of the human being's ontological status; Harman, for instance, is working to replace Kantian anthropocentrism with an anthrodecentric model wherein humans and objects are recognized as ontologically equivalent. Depriving humans' ontological status, however, could be seen as an effect of the expanded scale, if by scaling-up to the ends of the universe, the human, along with all other objects, disappears. On this scale, all objects, now divorced from spatiotemporal boundaries, share a common finitude, one that will take effect even after death; the physical remains of humans, their bodies, are assuredly equivalent ontologically with other things here, as they will likewise be swallowed by the sun. To privilege the ontological status of humans might amount to a kind of essentialism, as marking an innate and self-evident property of human being held as natural and universal, and thus to assume a higher ontological status might reinscribe the position that essence precedes existence. OOO's anthrodecentrism has generated much criticism for sustaining a nascent threat of nihilism; critics contend that, if objects are re-oriented as full participants in Being alongside (no longer beneath or underprivileged to) humans, then human values become no more than a fluke, and human agency no longer a matter of ethical consideration. Because OOO is still in its early stages, it has yet to fully answer all of its criticisms, especially those from political and ethical philosophy. This issue of scale might serve as a further contribution to OOO, but due to the ontology's underdeveloped status, I think it is still too early to tell how.

annihilating vastness of the cosmos," a reckoning with it. We see in poems like 1510 and 352 a willingness to think about the vast as understandable, manageable and containable. Poem 1510 features a "little Stone":

> How happy is the little Stone
> That rambles in the Road alone,
> And doesn't care about Careers
> And Exigencies never fears –
> Whose Coat of elemental Brown
> A passing Universe put on,
> And independent as the Sun
> Associates or glows alone,
> Fulfilling absolute Decree
> In casual simplicity – [1510]

Earth is sometimes referred to as "the third rock from the sun," a phrase that scales down its immense importance for the sustaining of life. This "little Stone," coated in "elemental Brown," measurable on the vast scale of the Universe, does not fear its demands and does not care for careers—it is "independent," non-contingent, open to possibilities. It fulfills its "absolute Decree / In casual simplicity," that is, unfolds-towards-its-absolute-demand with the kind of "peculiar calm" that Heidegger says "pervades [anxiety]" ("What is Metaphysics?" 88), and that defines *being-towards-death*.[282]

In poem 352, the speaker makes a seeming absurdity of scales by making equivalent the immensely large and the hand-held:

> Perhaps I asked too large –
> I take – no less than skies –
> For Earths, grow thick as
> Berries, in my native town – [352]

While it might sound absurd to say that "Earths grow" in her native town, the statement is anything but when rescaled: "Berries" to "Earths" suggests a comparison between the compositional orbs of atoms to sensible things; it implies that Earth is like a berry in that both sustain life, the former humanity, the later a microcosmos of animalcules. The earth contains berries, and berries contain "Earths." Scalar equivalency of this sort, in which

[282] See *Being and Time* section 254, where Heidegger writes, "[i]n anxiety in the face of death, Dasein is brought face to face with itself as delivered over to that possibility which is not to be outstripped" (298), and section 266, "[b]eing-towards-death is essentially anxiety" (310).

the very large is balanced with the very small, where each is imagined to contain the other, gets additional treatment in poem 632:

> The Brain – is wider than the Sky –
>
> For – put them side by side –
> The one the other will contain
> With ease – and You – beside –
>
> The Brain is deeper than the sea –
> For – hold them – Blue to Blue –
> The one the other will absorb –
> As Sponges – Buckets – do –
>
> The Brain is just the weight of God –
> For – Heft them – Pound for Pound –
> And they will differ – if they do –
> As Syllable from Sound – [632]

What had been once annihilated by cosmic vastness (our capacity to formulate hypotheses, to reason about the universe) here becomes equivalent to it; the brain is capable of perceiving the horizon, of thinking the greatest depths, and of creating conceptions as wild as life itself, and thus must somehow be as large, as deep, and as powerful as the vastness containing it. The re-scaling Dickinson enacts in this poem shows that measurement is not relegated to quantification alone. "There is no general rule," Dimock writes, "for the nesting relation between entities of different sizes," and "[q]uantification is probably not the way to go when it comes to our subjectivity, filled as it is with grand passions and petty worries, mental objects whose proportionality can hardly be calibrated by a one-size-fits-all yardstick" ("Low Epic" 619).[283]

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[283] Though I agree with Dimock's analysis as quoted, her continuation of it I find to be at odds with the existential force of her earlier argument:

> Just go back briefly to that catastrophe 4.5 thousand million years from now: that large-scale event is less a front-loaded trauma than a dimly perceived and gladly forgotten bit of information, tucked away at the back of our heads. This is what the back of a head is for: an all-purpose container, with almost inexhaustible holding capacity, the better to take in the infinite and everything else, a mere sideshow to a "You" who, though les then a speck on a cosmic scale, is here much more than that.

Dimock here undercuts her reading of Dickinson's confrontation with finitude and the annihilating vastness of the cosmos by recommending that we willfully forget the certain trauma of the universe's death. This attitude appears to be the chief source for McGurl's complaint, that Dimock ultimately fails to address the "existential dangers" of "thinking in terms of deep time" ("A Reply to Wai Chee Dimock" 635) by advocating for what Heidegger would view as an inauthentic *being-towards-death*, one that evades rather

Seeing the large contained in the small is like seeing an entire cosmos in a berry. In "The Brain – is wider than the Sky –" Dickinson sees in the human brain the same vastness she sees in the cosmos, and the same vastness she sees in the physical particular. From the standpoint of the small, Dickinson confronts the annihilation, counteracting it by, as Dimock puts it, turning "the intransigence of physical dimensions … into numbers-defying riddles … that tell us, with a straight face, that it is largeness that is limiting, not the other way around" ("Low Epic" 619-20). Comparing these poems, where the individual is annihilated by contemplation of the vast with those in which the vast is re-scaled as contained within the small, displays Dickinson's ability to express the tremendous weight of the empirically disclosed vastness of the cosmos while redeeming humanity as, perhaps, just as vast:

> All I may, if small,
> Do it not display
> Larger for the Totalness –
> 'Tis Economy
>
> To bestow a World
> And withhold a Star –
> Utmost, is Munificence –
> Less, tho' larger, poor. [819]

"All I may, if small" is about giving, and how the value of what one gives cannot be measured quantitatively, by the size of what is given. This speaker is willing to give it "all," everything she has, though it may not be much. And yet, because it is "all," it becomes "Larger" for its "Totalness." To think of what she gives as "small" is to imply a scale, an economic scale, divorced from the meaning carried by the great generosity of her act, the "Munificence;" it is to ignore the insight that "small" always already contains "all."

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than confronts its ownmost way of being. Then again, if McGurl is truly committed to thinking through the issue of deep time to better consider its "existential dangers" through reference to "existentialist thought more broadly [understood]" ("A Reply to Wai Chee Dimock" 635), then Dimock's point may be seen to resonate with Jean-Paul Sartre's claim that "a mock feeling and a true feeling are almost indistinguishable" ("Existentialism is a Humanism" 1165). In other words, existentially speaking, acting and being amount to somewhat the same thing; distinguishing an act as authentically comporting towards finitude from one that evades finitude may not be as easy as McGurl thinks, or very important to do.

Dickinson's poetry thus explores both the annihilation of humanity through a visually disclosed cosmic vastness, and the possibility of redemption through death as the saving power, the paradoxical source of significance. Clearly interested in the ends-of-the-world, the poet, like Dimock and McGurl, makes of the scalar extreme an existential qualifier, where the absolute limit of the scaled-up scale of deep time—the "World's Departure from a Hinge – / Or Sun's extinction" [985]—becomes less a means of measuring geological time, and more a means of measuring its value. If death sets things significant, and all things perish when the sun goes extinct, then all things, the big and the small, will be equal in death, and thus equal in significance. Dickinson thought about what it would mean for the sun to die, for light to go out, and must have considered it equally vast to the passing of just "one":

> We learn it in Retreating
> How vast an one
> Was recently among us –
> A Perished Sun
>
> Endear in the departure
> How doubly more
> Than all the Golden presence
> It was – before – [1083]

"Death sets a Thing significant" is here expanded to the death of the sun, where its worth, and the vastness of the one, can only be properly understood after the retreat. The perishing of the sun only matters insofar as it matters to us, and in its "Retreating," its *no-longer-being-there*, it becomes twice as valuable, doubly endearing, a quantity that strikes the reader as acceptable, even though the quantity being doubled is already immeasurable. Dickinson's ability to contain and confuse the scales, to write from the position of the small-scaled, detailed, particular and yet strike at large-scaled, axiomatic truths, to put the big and the small on equal footing, contributes to the issue of scale as presented by Dimock and McGurl by reminding us of the necessity of plurality, that any scale, regardless of its smallness, may contain measureless worlds of significance, and therefore must not be carelessly underestimated. The insight again resembles Heidegger's conclusion that, as Dasein's anticipation of death becomes "greater and greater," it comes to “know no measure at all, no more or less, but signifies the possibility of the measureless impossibility of existence” (307/262).

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